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pectinases.ST251

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pectinases.ST251

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pectinases.ST251

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<212> PRT
<213> Aspergillus niger

<400> 65

Met Lys Leu Pro Ile Leu Val Thr Leu Phe Ile Thr Leu Pro Ala Leu
1 5 10 15

Cys Val Ser Ser Lys Thr Pro Ser Ala Pro Thr Ile Ser Ala Tyr Pro
20 25 30

Lys Ser Pro Gly Asn Phe Lys Pro Ala Ser Gly Arg Gln Asn Ser Thr
35 40 45

Ser Asn Val Cys Glu Val Lys Pro Asn Gln Thr Asp Ala Ala Pro Gly
50 55 60

Ile Leu Ala Ala Ala His Thr Cys Asn Asn Gly Gly Thr Val Phe Leu
65 70 75 80

Pro Pro Gly Asp Phe Val Val Ala Thr Ala Leu Asp Leu Thr Phe Leu
85 90 95

Asn Asn Ile Asp Phe Ala Ile Trp Gly Asn Ile Thr Phe Lys Lys Asp
100 105 110

Ile Asp Leu Trp Thr Thr Gln Ala Phe Gln Tyr Thr Phe Gln Thr Ala
115 120 125

Ser Leu Phe Trp Arg Phe Gly Gly Asn Asn Val Asn Ile Tyr Gly Asp

pectinases.ST251

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    130                 135                 140

Gly Lys Gly Val Ile Asp Gly Ala Gly Gln Tyr Trp Trp Ser Ala Met
145                 150                 155                 160

Ala Glu Asp Ser Ser Val Met Arg Pro Cys Leu Leu Gly Thr Asp Gly
                165                 170                 175

Leu His His Ala Thr Ile Ser Gly Leu Thr Met Leu Asn Ser Pro Asn
            180                 185                 190

Trp Phe Asn Leu Ile Ala Asn Ser Thr Asp Ile Leu Ile Ser Asn Met
        195                 200                 205

Thr Met Leu Val Glu Ser Glu Ile Ser Asp Ala Pro Ala Lys Asn Thr
    210                 215                 220

Asp Gly Trp Asp Ile Tyr Arg Ser Ser Asn Ile Val Ile Gln Asp Ser
225                 230                 235                 240

Arg Ile Val Asn Thr Asp Asp Cys Val Ser Phe Lys Pro Asn Ser Thr
                245                 250                 255

Gln Ile Val Ile Gln Asn Leu Asp Cys Thr Gly Ser His Gly Ile Ser
            260                 265                 270

Val Gly Ser Leu Gly Gln Tyr Gln Gly Glu Thr Asp Ile Val Glu Asp
        275                 280                 285

Leu Tyr Ile Tyr Asn Ile Ser Met Thr Asp Ala Ser Asp Val Ala Arg
    290                 295                 300

Ile Lys Val Trp Pro Gly Val Pro Ala Asp Thr Ser Gly Ser Thr Ser
305                 310                 315                 320

Gly Gly Gly Leu Gly Arg Val Arg Asn Val Thr Tyr Glu His Met Gln
                325                 330                 335

Ser Glu Asn Asn Asp His Ile Ile Ser Val Ser Gln Cys Tyr Glu Ser
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pectinases.ST251

340 345 350

Lys Asn Gln Thr Met Cys Asp Ser Tyr Pro Ser Lys Leu Val Ile Glu
355 360 365

Asp Val Leu Phe Lys Asp Phe Lys Gly Thr Thr Ser Lys Lys Tyr Asp
370 375 380

Pro Glu Ile Gly Glu Leu Thr Cys Ser Ser Pro Asp Val Cys His Asn
385 390 395 400

Ile Thr Val Gln Asp Ile Asn Val Thr Pro Pro Ser Gly Asp Ser Pro
405 410 415

Thr Phe Thr Cys Asn Asn Met Gly Asn Ser Asn Leu Glu Asp Ile Thr
420 425 430

Cys Ala

<210> 66
<211> 463
<212> PRT
<213> Aspergillus niger

<400> 66

Met Ser Trp Ser Ser Pro Ala Ala Gln Tyr Ile Tyr Val Leu Val Ile
1 5 10 15

Gln Leu His Leu Trp Phe Ile Leu Lys Thr Ala Phe Ser Pro Ser Asn
20 25 30

Gln Ala Met Ala Pro Ile Ala Leu Lys Ile Leu Leu Phe Thr Ser Leu
35 40 45

Ile Val Pro Ser Ile Ser Leu Ser Asp Gln Ala Arg Asn Gly His Ala
50 55 60

Arg Thr Ile Cys Glu Val Lys Pro Gly Gly Ser Ser Glu Ile Asp Asp
65 70 75 80

pectinases.ST251

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Val Pro Ala Ile Val Asp Ala Leu Thr Thr Cys Gly Ser Gly Gly Arg
                85                  90                  95

Val Ile Phe Ser Asn Asn Thr Tyr His Ile Asn Ser Val Met Asn Thr
            100                 105                 110

Thr Trp Leu Asp Asp Val Glu Ile Asp Leu Gln Gly Thr Leu Leu Trp
        115                 120                 125

Ser Thr Asn Ile Ser Tyr Trp Leu Asn His Ser Leu Pro Val Gly Tyr
    130                 135                 140

Gln Asn Gln Ser Thr Ala Trp Ile Leu Gly Gly Lys Asp Ile Val Phe
145                 150                 155                 160

Glu Gly His Gly Tyr Gly Thr Phe Asn Gly Ser Gly Gln Thr Trp Tyr
                165                 170                 175

Arg Tyr Val Gly Ser Thr Ser Asn Tyr Pro Arg Arg Pro Asn Gln Leu
            180                 185                 190

Thr Val Ser Gly Ala Met Gly Ala Val Phe Lys Gly Leu Arg Phe Val
        195                 200                 205

Gln Ser Gln Met Trp Thr Met Ser Ile Ile His Thr Ser Asn Ser Trp
    210                 215                 220

Phe Asp Ser Ile Tyr Val Asn Asn Leu Tyr Asp Asp Gly Gly Ser Ala
225                 230                 235                 240

Gln Asn Thr Asp Gly Ala Asn Thr Ile Tyr Ser Lys Asn Ile Thr Leu
                245                 250                 255

Thr Asn Trp Glu Val Val Asn Gly Asp Asp Ser Ile Ser Thr Lys Ala
            260                 265                 270

Asn Ser Thr Asp Ile Thr Ile Ala Asn Cys Thr Phe Thr Ser Gly Leu
        275                 280                 285
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pectinases.ST251

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Gly Ile Ala Ile Gly Ser Ile Gly Gln Tyr Asn Gly Ala Phe Glu Thr
    290                 295                 300

Val Glu Arg Leu Lys Ile Ser Asn Ile Thr Tyr Glu Lys Thr Thr His
305                 310                 315                 320

Ala Val Tyr Phe Lys Thr Trp Thr Gly Asp Gln Val Gly Tyr Pro Pro
                325                 330                 335

Asn Gly Gly Gly Gly Gly Leu Gly Tyr Ala Ser Asp Ile Val Ala Thr
            340                 345                 350

Asn Leu Lys Thr Asn Asn Leu Lys Gly Ala Pro Phe Thr Ile Ser Gln
        355                 360                 365

Cys Thr Thr Phe Ser Gly Ala Ser Gly Asn Cys Thr Asn Ser Lys Phe
    370                 375                 380

Gln Ile Arg Asp Leu Val Phe Thr Asp Ile Ser Gly Thr Thr Asp Ser
385                 390                 395                 400

Ser Asp Val Ala Ser Phe Gln Cys Ser Ala Val Ala Pro Cys Glu Asp
                405                 410                 415

Ile Thr Ile Glu Asn Val Ser Leu Arg Ile Ala Gly Asn Thr Thr His
            420                 425                 430

Ala Glu Glu Tyr Leu Cys Gly Asn Val Asp Gly Thr Val Gly Phe Asn
        435                 440                 445

Cys Thr Gly Asp Val Cys Val Gly Ser Ser Ala Thr Gly Gly Cys
    450                 455                 460
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<210> 67
<211> 423
<212> PRT
<213> Aspergillus niger

<400> 67

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Val Gly His Ala Gly Asn Val Glu Asn Asn His Asn Val Cys Thr Val
            20                  25                  30

Arg Ala Asn Gly Gly His Gln Asp Asp Val Pro Asn Ile Met Ala Ala
        35                  40                  45

Phe Lys Glu Cys Gly Asn Gly Gly Thr Ile Ile Phe Pro Glu Asp Gln
    50                  55                  60

Ser Tyr Trp Ile Ala Thr Arg Leu His Pro Thr Leu Lys Asp Val Ala
65                  70                  75                  80

Ile Glu Trp Arg Gly Lys Trp Thr Phe Ser Asp Asn Leu Thr Tyr Trp
                85                  90                  95

Arg Asn Asn Ser Tyr Pro Ile Ala Phe Gln Asn His His Ala Gly Phe
            100                 105                 110

Ile Ile Ser Gly Asp Asn Ile Thr Ile Asn Gly Tyr Gly Thr Gly Gly
        115                 120                 125

Ile Asp Gly Asn Gly Asn Thr Trp Tyr Thr Ala Glu Lys Gly Asp Thr
    130                 135                 140

Gln Pro Gly Arg Pro Met Pro Phe Val Phe Trp Asn Val Ser Glu Val
145                 150                 155                 160

Ile Val Asp Ser Phe Tyr Val Lys Asp Pro Pro Leu Trp Ser Val Asn
                165                 170                 175

Ile Met Asn Gly Thr Asn Met Arg Phe Asn Asn Ile Tyr Cys Asn Ala
            180                 185                 190

Thr Ala Val Asp Ala Pro Trp Gly Asp Asn Trp Val Gln Asn Thr Asp
        195                 200                 205
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pectinases.ST251

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Gly Phe Asp Thr Met Asp Ala Thr Asn Ile Gln Leu Thr Asn Phe Val
    210                 215                 220

Tyr Gln Gly Gly Asp Asp Cys Ile Ala Ile Lys Pro Arg Ser Tyr Asn
225                 230                 235                 240

Ile Asp Ile Gln Asn Val Thr Cys Arg Gly Gly Asn Gly Ile Ala Ile
                245                 250                 255

Gly Ser Leu Gly Gln Tyr Leu Glu Asp Ser Ser Val Ala Asn Ile Arg
            260                 265                 270

Val Asp Lys Val Asn Ile Ile Arg Tyr Asn Glu Asp Met His Asn Ser
        275                 280                 285

Ala Tyr Leu Lys Thr Trp Val Gly Ala Leu Val Pro Gln Ser Ser Tyr
    290                 295                 300

Glu Ser Ala Gly Val Pro Arg Gly Asp Gly Trp Gly Ser Ile Arg Asn
305                 310                 315                 320

Val Leu Phe Ser Asn Phe Asn Val Gln Gly Ala Ser Ala Gly Pro Ser
                325                 330                 335

Ile Ser Gln Asp Ser Gly Asp Asn Gly Ser Tyr Ala Gly Thr Ser Lys
            340                 345                 350

Met Ser Ile Ser Asn Val Ala Phe Val Asn Phe Thr Gly Trp Val Asp
        355                 360                 365

Thr Glu Lys Ser Val Val Ser Thr Val Ser Cys Ser Glu Val His Pro
    370                 375                 380

Cys Tyr Asn Ile Asp Tyr Asp Asn Val Val Leu Tyr Pro Gly Lys Asn
385                 390                 395                 400

Ala Thr Thr Ala Gly Thr Gly Ser Cys Lys Tyr Thr Ala Asp Gly Gly
                405                 410                 415
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pectinases.ST251

Val His Gly Leu Ser Gly Cys
420

<210> 68
<211> 343
<212> PRT
<213> Aspergillus niger

<400> 68

Met Pro Ser Ala Ile Ser Ile Gly Val Ile Ala Gly Leu Ser Val Ala
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Ala Ser Ala Val Pro Ser Leu Gln Lys Asn Gly Thr Thr Cys Thr Val
20 25 30

Ile Pro Leu Gly Asn Gly Gln Asp Asp Val Pro Asn Ile Leu Ser Ala
35 40 45

Val Asp Glu Cys Gly Gln Thr Ser Gly Gly Arg Val Val Leu Pro Ala
50 55 60

Pro Tyr Thr Tyr Arg Ile Asn Gln Arg Met Thr Thr His Leu Thr Asp
65 70 75 80

Ser Arg Leu Glu Ile Gly Gly Thr Leu Leu Phe Ser Asp Asp Ile Asp
85 90 95

Tyr Trp Val Asn Asn Ser Tyr Arg Val Asp Phe Gln Asn Gln Ser Ser
100 105 110

Ala Trp Arg Ile Thr Gly His Asp Tyr Val Val Asp Gly Gly Pro Arg
115 120 125

Gln Gly Gly Val Asp Gly Asn Gly Gln Leu Trp Tyr Thr Trp Ala Lys
130 135 140

Gly Gly Ser Asn Val Phe Gly Arg Pro Met Pro Val His Val Phe Glu
145 150 155 160

pectinases.ST251

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Ser Thr Arg Ala Thr Leu Arg Asn Leu Ala Ile Arg Gln Pro Gln Phe
                165                 170                 175

Trp Ala Val Leu Val Asp Ser Ser Ser His Ile Asn Leu Asp Asn Phe
            180                 185                 190

Tyr Val Asn Ala Thr Asn His Asp Ser Ser Val Ser Pro Glu Gly Glu
        195                 200                 205

Trp Val Gln Asn Thr Asp Gly Ile Asp Thr Tyr Arg Ser Asp His Ile
    210                 215                 220

Thr Val Thr Asn Trp Val Tyr Gln Gly Gly Asp Asp Ala Val Ala Phe
225                 230                 235                 240

Lys Gly Asn Ser Thr Asn Ile His Val Glu Asn Val Thr Val Tyr Gly
                245                 250                 255

Gly Pro Gly Ile Ala Phe Gly Ser Leu Gly Gln Tyr Pro Asp Arg Thr
            260                 265                 270

Asp Ile Val Glu Asn Val Thr Val Arg Asn Val Arg Val Gln Pro Ser
        275                 280                 285

Phe Gln Arg Ala Met Asn Ser Gly Val Tyr Phe Lys Ser Trp Ile Gly
    290                 295                 300

Val Asn Tyr Gly Val Pro Pro Asn Gly Gly Gly Gly Gly His Gly Tyr
305                 310                 315                 320

Val Arg Asn Val Ser Val Glu Asn Leu Arg Leu Lys Asp Val Gln Leu
                325                 330                 335

Pro Val Tyr Ile Asp Thr Trp
            340
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<210> 69
<211> 438
<212> PRT
<213> Aspergillus niger

pectinases.ST251

<400> 69

Met Tyr Leu Leu Pro Leu Thr Leu Phe Leu Thr Ala Ala Phe Gly Val
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Ser Ile Pro Arg Ser Pro Leu Ile Pro Gly Ala Gln Ile Val Pro Ala
20 25 30

Ser Ser Thr Ala Asp Leu Arg Ala Ile Gly Ala Gln His His Lys Tyr
35 40 45

Pro Asp Arg Glu Thr Val Thr Ile Arg Ala Ser Arg Asn Ala Leu Asp
50 55 60

Asp Val Ser Ser Asp Phe Leu Trp Gly Leu Lys Gln Ala Asn His Gly
65 70 75 80

Gly Arg Leu Leu Leu Lys Gln Gly Glu Thr Tyr Val Ile Gly Lys Lys
85 90 95

Leu Asp Leu Thr Phe Leu Asp Asn Ile Glu Val Gln Leu Glu Gly Glu
100 105 110

Ile Gln Phe Thr Asn Asn Ile Thr Tyr Trp Gln Ala Asn Asn Phe Tyr
115 120 125

Tyr Asp Phe Gln Lys Ser Ile Thr Phe Trp Arg Trp Gly Gly Gln Asp
130 135 140

Ile Lys Ile Phe Gly Ser Gly Val Leu Asn Gly Asn Gly Gln Lys Trp
145 150 155 160

Tyr Asp Glu Phe Ala Gly Lys Gln Ile Leu Val Tyr Asn Thr Phe Tyr
165 170 175

Arg Pro Ile Leu Phe Leu Thr Asp Asn Ala Thr Arg Ile Ser Val Glu
180 185 190

Gly Ile Thr Gln Leu Asn Ser Pro Cys Trp Thr Asn Phe Phe Val Arg

pectinases.ST251

195 200 205

Thr Asn Asp Val Ser Phe Asp Asn Val Tyr Ile His Ala Phe Ser Thr
210 215 220

Asn Ala Ser Ser Asp Pro Ala Asn Thr Asp Gly Met Asp Ser Leu Asp
225 230 235 240

Val Asp Gly Val Ser Phe Thr Asn Met Arg Ile Asp Val Gly Asp Asp
245 250 255

Cys Phe Ser Pro Lys Pro Asn Thr Thr Asn Ile Phe Val Gln Asn Met
260 265 270

Trp Cys Asn Asn Thr His Gly Val Ser Met Gly Ser Ile Gly Gln Tyr
275 280 285

Ala Gly Glu Met Asp Ile Ile Glu Asn Val Tyr Ile Glu Asn Val Thr
290 295 300

Leu Leu Asn Gly Gln Asn Gly Ala Arg Leu Lys Ala Trp Ala Gly Gln
305 310 315 320

Asp Val Gly Tyr Gly Arg Ile Asn Asn Val Thr Tyr Lys Asn Ile Gln
325 330 335

Ile Gln Asn Thr Asp Ala Pro Ile Val Leu Asp Gln Cys Tyr Phe Asp
340 345 350

Ile Asn Ala Thr Glu Cys Ala Lys Tyr Pro Ser Ala Val Asn Ile Thr
355 360 365

Asn Ile Leu Phe Glu Asn Ile Trp Gly Ser Ser Ser Gly Lys Asp Gly
370 375 380

Lys Ile Val Ala Asp Leu Val Cys Ser Pro Asp Ala Val Cys Thr Asn
385 390 395 400

Ile Thr Leu Ser Asn Val Asn Leu Thr Ser Pro Lys Gly Thr Ala Glu

pectinases.ST251

405 410 415

Ile Val Cys Asp Asp Ile Gln Gly Gly Ile Gly Val Asp Cys Val Ser
420 425 430

Asp Glu Ser Val Thr Arg
435

<210> 70
<211> 397
<212> PRT
<213> Aspergillus niger

<400> 70

Met Leu Leu His Gly Leu Leu Leu Ala Leu Gln Ala Ile Leu Ala Ser
1 5 10 15

Ser Ala Ala Ile Thr Ser Pro Ser Ser Asn His Leu Ser Thr Ala Ala
20 25 30

Arg Glu Lys Cys Gln Thr Thr Leu Gln Cys Pro Pro Gly Thr Leu Ile
35 40 45

Val Ser Asn Thr His Pro Gln Leu Ser Asn Phe Thr Thr Leu Gln Ala
50 55 60

Ala Ile Asn Ala Leu Pro Asn Asp Asn Ser Ser Gln Thr Ile Leu Leu
65 70 75 80

Leu Ser Gly Ser Tyr Asn Glu Gln Val Asn Ile Thr Arg Ser Gly Pro
85 90 95

Ile Thr Leu Leu Gly Gln Gln Pro Asp Arg Ala Ala Leu Thr Asp Pro
100 105 110

Ala Arg Asn Thr Val Asn Leu Thr Phe Ala Gly Ala Asn Ser Asp Ser
115 120 125

Thr Gly Asp Ile Asp Asn Val Trp Phe Ser Val Met Val Val Ala Pro
130 135 140

pectinases.ST251

Thr Leu Asp Ala Ser Leu Thr Gly Ser Gly Thr Thr Gly Tyr Pro Val
145 150 155 160

Pro Ala Asp Thr Pro Phe Gly Asn Thr Asp Phe Arg Val Tyr Asn Ile
165 170 175

Asp Phe Arg Asn Thr Tyr Ala Pro Tyr Ser Ala Gly Pro Ala His Ala
180 185 190

Ile Ser Phe Ser Arg Ser Asn Gly Gly Phe Tyr Tyr Cys Gly Phe Tyr
195 200 205

Ser Tyr Gln Asp Thr Ile Tyr Ile Gly Lys Leu Gly Ser Ala Tyr Met
210 215 220

Tyr Lys Ser Ile Leu Ala Gly Gln Thr Asp Phe Leu Tyr Gly Phe Gly
225 230 235 240

Thr Leu Phe Ile Gln Ser Ser Gln Ile Val Leu Arg Ser Cys Gly Gly
245 250 255

Gly Ile Thr Ala Trp Lys Gly Thr Asn Thr Thr Val Arg Asn Asn Tyr
260 265 270

Gly Val Tyr Ile His Asp Ser Thr Val Asn Ala Ala Asn Thr Ser Ile
275 280 285

Ala Glu Gln Ile Lys Gly Ser Cys Ala Leu Gly Arg Pro Trp Asn Ser
290 295 300

Leu His Arg Ser Ile Phe Ala Asn Thr Tyr Glu Asp Gly Ser Ile Glu
305 310 315 320

Pro Ser Gly Tyr Ile Asn Trp Glu Asp Arg Trp Ser Lys Asn Glu Thr
325 330 335

Leu Met Ala Glu Tyr Lys Ala Tyr Gly Pro Gly Phe Asn Leu Thr Gly
340 345 350

pectinases.ST251

```
Arg Arg Glu Ser Glu Val Ser Val Leu Leu Ser Ser Ser Glu Glu Glu
        355                 360                 365

Arg Tyr Arg Asp Pro Ser Arg Leu Phe Leu Phe Glu Asp Gly Arg Glu
    370                 375                 380

Gly Asn Val Ala Trp Ile Asp Trp Asp Val Val Ser Ser
385                 390                 395
```

<210> 71
<211> 327
<212> PRT
<213> Aspergillus niger

<400> 71

```
Met His Thr Pro Tyr Leu Leu Gly Ala Leu Ala Ala Leu Ala Ala Thr
1               5                   10                  15

Ala Val Gly Ala Pro Ala Glu His Ile Lys Lys Arg Glu Ser Arg Thr
            20                  25                  30

Ser Ala Pro Ser Gly Cys Leu Thr Val Gly Ser Asp Gly Thr Tyr Ser
        35                  40                  45

Thr Ile Gly Asp Ala Leu Asp Ala Leu Gly Ser Ser Thr Ser Ser Ala
    50                  55                  60

Cys Ile Tyr Val Ala Ser Gly Thr Tyr Glu Glu Gln Leu Thr Ile Asp
65                  70                  75                  80

Tyr Ala Gly Asn Leu Thr Leu Tyr Gly Glu Thr Thr Asp Thr Ser Thr
                85                  90                  95

Tyr Lys Asp Asn Val Val Thr Ile Thr His Thr Ile Ser Ser Ser Asp
            100                 105                 110

Ala Gly Ser Leu Asp Lys Ser Ala Thr Val Asn Val Val Ser Asp Gly
        115                 120                 125
```

pectinases.ST251

```
Phe Ser Met Tyr Asn Ile Asn Val Glu Asn Gly Tyr Gly Glu Gly Ala
    130                 135                 140

Gln Ala Val Ala Leu Val Gly Asn Ala Asp Gln Leu Gly Phe Tyr Gly
145                 150                 155                 160

Cys Gln Phe Ser Gly Tyr Gln Asp Thr Leu Tyr Val Lys Ala Gly Thr
                165                 170                 175

Gln Tyr Tyr Ser Asn Cys Met Ile Glu Gly Ala Val Asp Tyr Ile Phe
            180                 185                 190

Gly Asp Ala Ser Val Trp Phe Gly Glu Cys Asp Ile Val Ser Asn Gly
        195                 200                 205

Ala Gly Ala Ile Thr Ala Ser Ser Arg Glu Thr Ser Ser Asp Ser Gly
    210                 215                 220

Trp Tyr Ala Ile Asp Asn Cys Asn Ile Lys Ala Ala Ser Gly Val Ser
225                 230                 235                 240

Leu Thr Glu Glu Val Tyr Leu Gly Arg Pro Trp Arg Val Leu Ala Arg
                245                 250                 255

Val Ile Tyr Gln Asn Ser Val Leu Ser Asp Ile Ile Asn Pro Lys Gly
            260                 265                 270

Trp Thr Thr Met Ala Asp Gly Ala Thr Pro Leu Tyr Tyr Glu Tyr Asn
        275                 280                 285

Asn Ser Gly Ala Gly Ser Asp Thr Ser Asp Arg Glu Tyr Glu Thr Ser
    290                 295                 300

Ile Ser Ala Ala Val Asp Lys Thr Thr Val Leu Gly Glu Thr Trp Gly
305                 310                 315                 320

Asp Trp Ile Asp Arg Ser Tyr
                325
```

pectinases.ST251

<210> 72
<211> 459
<212> PRT
<213> Aspergillus niger

<400> 72

Met Arg Ala Ser Ile Leu Pro Leu Thr Leu Phe Leu Ala Thr Leu Ala
1 5 10 15

Gly Ala Gln Leu Ser Gly Pro Val Gly Pro Leu Val Asp Tyr Ser Thr
20 25 30

Lys Ala Arg Asn Gln Thr Cys Asn Ile Ile Asp Tyr Gly Ala Val Ala
35 40 45

Asp Gly Lys Thr Asp Ile Ser Gln Ala Leu Leu Asp Ala Trp Gly Asn
50 55 60

Cys Ser Val Gly Gly Leu Val Tyr Ile Pro Pro Gly Asn Tyr Ser Leu
65 70 75 80

Ala Glu Asp Ile Glu Leu Lys His Gly Gln Ser Ser Ala Ile Gln Leu
85 90 95

Asp Gly Val Val Met Arg Gly His Arg Gly Ser Tyr Gln Met Ile Leu
100 105 110

Ile Arg Asp Cys Asn Asp Phe Glu Phe Phe Ser Gly Asn Ser Arg Gly
115 120 125

Ala Ile Gln Gly Phe Gly Tyr Glu Tyr Leu Gln Asn Asp Thr Tyr Gly
130 135 140

Glu Arg Leu Leu Arg Ile Gln Glu Val Asn Asn Phe Ser Val His Gly
145 150 155 160

Phe Ala Leu Ile Asp Ser Pro Ser Tyr Tyr Ile Val Phe Asp Thr Val
165 170 175

pectinases.ST251

Thr Ser Gly Glu Val Tyr Asn Ile Leu Ile Arg Gly Val Thr Ser Val
180 185 190

Gly Ala Thr Asp Ala Ile Asp Val Trp Gly Glu Asn Met Trp Phe His
195 200 205

Asp Ile Glu Val Ser Asn Gly Asp Glu Cys Val Thr Val Lys Ser Pro
210 215 220

Ala His Asn Tyr Leu Ile Glu Asn Ile Tyr Cys Asn Leu Ser Gly Gly
225 230 235 240

Thr Ala Ile Gly Ser Leu Gly Thr Gly Thr Asn Ile Ser Asp Ile His
245 250 255

Tyr Arg Asn Leu Tyr Met Asn Gln Ala Asp Ala Cys Phe Leu Lys Ser
260 265 270

Asn Asn Gly Asp Gly Ile Val Lys Asn Ile Ile Trp Glu Asn Val Ile
275 280 285

Val His Gly Gly Pro Tyr Pro Leu Ala Ile Asp Glu Ala Trp Gly Asp
290 295 300

Asp Arg Gly Ser Val Gly Val Gln Val Ser Asn Leu Thr Phe Arg Asn
305 310 315 320

Trp His Gly Glu Ser Val Ser Ala Ser Arg Pro Val Ile Arg Leu Gln
325 330 335

Cys Asp Ser Asp Val Pro Cys Tyr Asp Ile Thr Ile Glu Asn Val Asn
340 345 350

Leu Trp Ala Asn Asp Ser Asn Tyr Val Val Trp Gln Cys Glu Asn Ala
355 360 365

Tyr Gly Asp Gly Ala Cys Leu Ser Ser Ala Glu Gly Thr Lys Asp Leu
370 375 380

pectinases.ST251

```
Glu Thr Phe Thr Ser Lys Gln Thr Ile Thr Ala Thr Pro Ser Tyr Ala
385                 390                 395                 400

Ala Pro Thr Met Ala Ala Asp Phe Thr Phe Asn Leu Pro Ser Thr Ser
                405                 410                 415

Pro Phe Thr Ile Pro Pro Met Pro Thr Ser Phe Tyr Pro Gly Ala Thr
            420                 425                 430

Pro Ile Ser Thr Leu Leu His Leu His Gly Ala Gly Gly Leu Pro Ser
        435                 440                 445

Ala Ser Pro Ile Ser His His Arg Arg His Gln
    450                 455
```

<210> 73
<211> 474
<212> PRT
<213> Aspergillus niger

<400> 73

```
Met Arg Ser Ile Leu Phe Ile Leu Phe Ser Val Phe Ala Gly Leu Ala
1               5                   10                  15

Ala Gly Gln Leu Ile Gly Pro Val Gly Pro Thr Thr Gln Leu Glu Asp
            20                  25                  30

Lys Asp Ile Glu Cys Asn Ile Leu Asp Tyr Gly Gly Val Ala Asp Asn
        35                  40                  45

Glu Thr Asp Val Ala Thr Ser Ile Glu Thr Thr Phe Thr Glu Cys Val
    50                  55                  60

Leu Asn Asn Pro Lys Ser Arg Leu Val Ile Pro Glu Gly Asp Tyr Leu
65                  70                  75                  80

Ile Lys Arg Ser Val Val Leu Ser Asn Gly Thr Asn Trp Ala Phe Gln
                85                  90                  95

Leu Asp Gly Leu Ile Thr Ala Ala Tyr Gly Gly Asn Trp Thr Val Asp
```

pectinases.ST251

100 105 110

Pro Val Asp Phe Glu Phe Tyr Ser Ser Asn Gly Leu Gly Ala Phe Gln
115 120 125

Gly Gln Gly Tyr Ile Tyr Arg Asn Leu Ala Asn Thr Asp Arg Pro Arg
130 135 140

Leu Val Arg Leu Ile Ser Pro Thr Asn Ala Ser Val His Asp Leu Ile
145 150 155 160

Leu Val Asp Ser Pro Lys Phe His Ile Val Phe Asp Phe Ala Val Asn
165 170 175

Leu Glu Ala Tyr His Leu Thr Ile Arg Gly Ala Asn Leu Gly Ser Tyr
180 185 190

Asp Gly Ile Asp Ala Ile Gly Thr Asn Tyr Tyr Ile His Asp Asn Glu
195 200 205

Ala Ile Thr Asn Arg Asp Glu Cys Val Ser Val Lys Ser Pro Ser His
210 215 220

His Ala Leu Val Glu Asn Leu Val Cys Asn Gln Ala Gly Ser Gly Val
225 230 235 240

Ser Ile Gly Ser Leu Asn Val Ser Ala Glu Ile Ser Asn Ile Glu Ala
245 250 255

Arg Asn Ile Ser Ile Ile Gln Gly Asn Asn Ile Ala Phe Ile Lys Thr
260 265 270

Tyr Pro Gly Gly Ser Gly Tyr Val Lys Asp Val Thr Phe Glu Asn Phe
275 280 285

Arg Ser Leu Asn Ser Leu Tyr Gly Leu Asp Ile Asn Gln Tyr Trp Gln
290 295 300

Asn Thr Trp Glu Pro Asp Thr Gly Ser Val Thr Leu Ser Asn Leu Val

pectinases.ST251

305 310 315 320

Phe Lys Asn Phe Ser Gly Ser Val Ala Asp Gly Ala Leu Arg Pro Pro
325 330 335

Leu Tyr Leu Phe Ala Ser Asp Leu Thr Phe Ala Thr Asn Val Thr Val
340 345 350

Glu Glu Phe Ser Val Trp Thr Glu Thr Gly Thr Thr Val Val Asn Lys
355 360 365

Ile Ser Asn Ile Phe Gly Thr Gly Asp Asp Ser Tyr Gly Glu Asn Asp
370 375 380

Gly Ile Glu Ser Leu Gln Ser Gly Glu Ser Pro Tyr Thr Tyr Thr Ser
385 390 395 400

Thr Tyr Thr Ile Thr Ala Ser Pro Thr Asn Trp Gln Ala Pro Ser Thr
405 410 415

Pro Thr Trp Ala Leu Pro Ser Thr Gly Tyr Gly Ser Lys Phe Asn Glu
420 425 430

Asn Cys Ser Gly Tyr Phe Tyr Ile Ala Asn Leu Ser Thr Ala Ala Ser
435 440 445

Pro Ile Pro Val Tyr Thr Pro Ala Pro Leu Trp Arg Pro Gly Gly Ile
450 455 460

Asp Tyr Asn Leu His Tyr Trp Gly Ser Phe
465 470

<210> 74
<211> 443
<212> PRT
<213> Aspergillus niger

<400> 74

Met Leu Val Thr Ser Leu Ile Ala Leu Leu Pro Ala Ile Ala Ala Ala
1 5 10 15

pectinases.ST251

```
Gln Val Ser Gly Thr Val Gly Pro Arg Thr Ser Ala Ser Ala Lys Ala
            20                  25                  30

Ala Glu Lys Val Cys Asn Val Leu Asp Tyr Gly Ala Ser Ala Asn Ser
        35                  40                  45

Thr Ile Asp Ile Gly Pro Pro Leu Lys Glu Ala Phe Gln Asp Cys Gln
    50                  55                  60

Thr Gly Gly Leu Val Tyr Ile Pro Glu Gly Asp Tyr Leu Leu Ser Ser
65                  70                  75                  80

Trp Val Ser Leu Val Tyr Gly Ser Gly Trp Ala Leu Gln Leu Asp Gly
                85                  90                  95

Ile Ile Tyr Arg Asp Lys Asn Val Thr Asp Gly Gly Asn Met Ile Phe
            100                 105                 110

Ile Glu His Thr Ser Asp Ile Glu Ile Phe Ser Asn Asn Ser Ala Gly
        115                 120                 125

Ala Ile Gln Gly Tyr Gly Tyr Leu Phe His Glu Gln Asp Glu Tyr Gly
    130                 135                 140

Pro Arg Ile Leu Arg Leu Asn Asn Val Thr Asp Phe Ser Val His Asp
145                 150                 155                 160

Leu Ile Leu Val Asp Ser Pro Ala Tyr Phe Leu Asn Leu Val Glu Ser
                165                 170                 175

Tyr Asn Gly Glu Val Tyr Asn Met Val Ile Arg Gly Ala Ser Met Gly
            180                 185                 190

Gly Leu Asp Gly Ile Asp Ile Ser Gly Ala Asn Tyr Trp Ile His Asp
        195                 200                 205

Val Glu Val Thr Asn Gly Asp Glu Cys Val Thr Val Lys Ser Pro Ser
    210                 215                 220
```

pectinases.ST251

```
Ala Asn Val Arg Val Glu Asn Val Phe Cys Asn His Ser Gly Gly Cys
225                 230                 235                 240

Ala Met Gly Ser Leu Gly Thr Asp Thr Asn Ile Ser Asn Ile Glu Phe
                245                 250                 255

Glu Asn Ile Tyr Thr Tyr Asn Ser Thr Gln Met Tyr Met Ile Lys Ser
            260                 265                 270

Asn Gly Gly Asn Gly Thr Val Thr Asn Cys Ser Phe Lys Asn Phe Ile
        275                 280                 285

Gly Tyr Ser Asn Ala Tyr Met Leu Asp Leu Asp Thr Tyr Trp Gly Asp
    290                 295                 300

Glu Ser Asp Gly Asp Gly Ile Lys Tyr Glu Asn Ile Gly Phe Glu Asn
305                 310                 315                 320

Trp Lys Gly Thr Ser Ser Asn Gly Ile Gln Arg Ser Pro Ile Arg Ile
                325                 330                 335

Leu Cys Pro Asp Ala Asn Pro Cys Thr Asn Ile Thr Leu Thr Ala Val
            340                 345                 350

Glu Leu Trp Thr Asp Thr Gly Asp Tyr Val Lys Gln Glu Cys Ser Ser
        355                 360                 365

Ala Tyr Gly Glu Gly Glu Cys Leu Arg Gln Gln Asn Gly Thr Leu Ala
    370                 375                 380

Ser Tyr Ser Phe Thr Thr Thr Ile Thr Ser Val Pro Val Thr Ala Tyr
385                 390                 395                 400

Ser Pro Thr Thr Thr Met Pro Gly Leu Ile Ser Thr Ser Met Asp Thr
                405                 410                 415

Thr Thr Ser Ile Pro Ile Pro Thr Ile Pro Thr Ser Phe Phe Pro Gly
            420                 425                 430
```

pectinases.ST251

```
Ala Ser Ala Tyr Ser Thr Leu Met Ala Asn Met
        435                 440


<210>  75
<211>  447
<212>  PRT
<213>  Aspergillus niger

<400>  75

Met Thr Trp Ser Thr Ser Phe Leu Val Ala Thr Ser Leu Leu Ser Ile
1               5                   10                  15


Ile Asn Ser Val His Ala Gln Leu Thr Gly Ser Val Gly Pro Leu Thr
            20                  25                  30


Ser Val Ile Asp Lys Ala Ala Val Lys Thr Cys Asn Val Cys Asp Tyr
        35                  40                  45


Gly Ala Ser Ser Asp Asn Thr Thr Gly Val Gly Gln Pro Ile Ile Asp
    50                  55                  60


Ala Phe Thr Asp Cys Gly Ser Gly Gly Leu Ile His Val Pro Glu Gly
65                  70                  75                  80


Asp Tyr Leu Leu Lys Asp Trp Val Ser Ser Glu Asn Gly Ser Ala Trp
                85                  90                  95


Ser Ile Gln Leu Asp Gly Val Leu His Trp Asp Ser Ser Pro Ser Ala
            100                 105                 110


Gln Ser Tyr Ile Phe Ala Ile Thr Gly Gly Ser Asp Ser Glu Leu Ser
        115                 120                 125


Ser Ser Asn Ala Thr Gly Ala Ile Gln Gly Ser Gly Tyr Leu Tyr His
    130                 135                 140


Arg His Asn Thr Tyr Thr Ser Pro Arg Met Leu Tyr Ile Ser Gly Cys
145                 150                 155                 160
```

pectinases.ST251

```
Arg Ile Gly Pro Phe Met Thr Trp Tyr Trp Ser Thr Arg Leu Cys Pro
                165                 170                 175

Thr Leu Ser Leu Thr Ala Val Thr Met Glu Lys Arg Thr Ile Trp Leu
            180                 185                 190

Ser Val Val Val Ile Thr Val Val Trp Met Ala Leu Ile Leu Pro Leu
        195                 200                 205

Leu Leu Asn Val His Ser Ile Ser Gly Asn Ala Asn Ala Thr Ala Ala
    210                 215                 220

Arg Pro Asn Ser His Asn Phe Leu Ile Glu Asn Ile Tyr Cys Asn Pro
225                 230                 235                 240

Ser Gly Gly Cys Ala Ile Gly Ser Leu Gly Ser Ser Val Asn Val Thr
                245                 250                 255

Asn Ile Leu Tyr Arg Asn Val Tyr Thr Trp Asp Ser Asn Gln Met Met
            260                 265                 270

Met Ile Lys Thr Asn Gly Gly Leu Gly Asn Val Ser Asn Ile Val Phe
        275                 280                 285

Glu Asn Phe Ile Gly His Gly Asn Val Asn Ser Leu Asp Leu Asp Ser
    290                 295                 300

Tyr Trp Ser Ser Met Asn Ala Ile Asp Gly Val Gly Ile Tyr Tyr His
305                 310                 315                 320

Asn Ile Thr Ile Tyr Asn Trp Thr Gly Thr Ala Ile Asp Gly Glu Thr
                325                 330                 335

Arg Pro Pro Ile Arg Val Ile Cys Pro Glu Asp Met Pro Cys Thr Glu
            340                 345                 350

Ile Thr Leu Val Gln Ile Asp Leu Leu Val Glu Glu Gly Arg Tyr Asp
        355                 360                 365
```

pectinases.ST251

```
Glu Tyr Tyr Cys Ala Ile Ala Cys Gly Gly Tyr Cys Leu Asp Ser Ala
    370                 375                 380

Thr Ser Thr Leu Thr Thr Tyr Thr Thr Thr Thr Tyr Gly Asn Ser Ala
385                 390                 395                 400

Ser Thr Gly Tyr Glu Ala Pro Thr Met Ala Asp Asp Leu Ala Thr Ala
                405                 410                 415

Phe Gly Thr Thr Ala Ser Ile Pro Thr Pro Thr Thr Pro Ala Ser Phe
            420                 425                 430

Phe Phe Pro Gly Val Ala Pro Val Ser Ala Val Ala Gly Ser Ser
        435                 440                 445
```

<210> 76
<211> 533
<212> PRT
<213> Aspergillus niger

<400> 76

```
Met Leu Ser Lys Thr Ser Leu Leu Ser Leu Leu Ser Leu Ala Ala Gly
1               5                   10                  15

Val Val Asn Ala Asp Phe Gly Ile Thr Thr Asn Asp Asp Ser Tyr Val
            20                  25                  30

Ile Asn Ala Asn Ser Pro Asn Ser Leu Val Phe Thr Val Asp Arg Gly
        35                  40                  45

Ser Cys Asp Ile Thr Ser Ile Val His Tyr Gly Thr Glu Leu Gln Tyr
    50                  55                  60

Ser Gly Lys Gly Ser His Ile Gly Ser Gly Leu Gly Thr Ala Thr Val
65                  70                  75                  80

Ser Ala Thr Lys Ser Gly Ala Gly Asp Tyr Ile Lys Val Thr Cys Glu
                85                  90                  95
```

pectinases.ST251

```
Thr Asp Thr Leu Thr Gln Tyr Met Val Val His Asp Gly Asp Pro Ile
            100                 105                 110

Ile His Met Ala Thr Tyr Ile Thr Glu Glu Pro Ser Ile Gly Glu Leu
        115                 120                 125

Arg Phe Ile Ala Arg Leu Asn Ser Asp Val Leu Pro Asn Glu Glu Pro
    130                 135                 140

Phe Gly Asp Val Ser Asn Thr Ala Asp Gly Glu Ala Ile Glu Gly Ser
145                 150                 155                 160

Asp Val Phe Leu Val Asp Gly Glu Thr Arg Ser Lys Phe Tyr Ser Ser
                165                 170                 175

Gln Arg Phe Ile Asp Asp Gln Arg His Cys Ile Ala Gly Asp Glu His
            180                 185                 190

Arg Val Cys Met Ile Leu Asn Gln Tyr Glu Thr Ser Ser Gly Gly Pro
        195                 200                 205

Phe His Arg Asp Ile Asn Ser Asn Asn Gly Gly Asp Tyr Asn Ser Leu
    210                 215                 220

Tyr Trp Tyr Met Asn Ser Gly His Val Gln Leu Glu Ser Tyr Arg Met
225                 230                 235                 240

Gly Leu His Gly Pro Tyr Ser Met Tyr Phe Ser Arg Ser Gly Thr Pro
                245                 250                 255

Ser Thr Asp Ile Asp Thr Ser Phe Phe Ala Asp Leu Asp Ile Glu Gly
            260                 265                 270

Tyr Val Ala Glu Ser Gly Arg Gly Thr Val Ser Gly Thr Ala Ser Gly
        275                 280                 285

Ala Asp Ser Ser Phe Asp Trp Val Val His Trp Tyr Asn Asp Asp Ala
    290                 295                 300
```

pectinases.ST251

```
Gln Tyr Trp Thr Tyr Thr Ser Ser Ser Gly Ser Phe Thr Ser Pro Ala
305                 310                 315                 320

Met Lys Pro Gly Thr Tyr Thr Met Val Tyr Tyr Gln Gly Glu Tyr Val
                325                 330                 335

Val Ala Thr Ser Glu Val Thr Val Ser Ala Gly Ser Ser Thr Ser Lys
            340                 345                 350

Asp Ile Ser Gly Ser Val Glu Thr Gly Thr Thr Ile Phe Lys Ile Gly
        355                 360                 365

Asp Trp Asp Gly Gln Pro Thr Gly Phe Arg Asn Ala Glu Asn Gln Leu
    370                 375                 380

Arg Met His Pro Ser Asp Ser Arg Met Ser Asp Trp Gly Pro Leu Thr
385                 390                 395                 400

Tyr Thr Val Gly Ser Ser Ser Leu Thr Asp Phe Pro Met Ala Ile Phe
                405                 410                 415

Lys Ser Val Asn Ser Pro Val Thr Ile Lys Phe Thr Ala Thr Ser Asp
            420                 425                 430

Gln Thr Gly Ala Ala Thr Leu Arg Ile Gly Thr Thr Leu Ser Phe Ala
        435                 440                 445

Gly Gly Arg Pro Gln Ala Thr Ile Asn Asp Tyr Glu Gly Ser Ala Pro
    450                 455                 460

Ser Ala Pro Thr Asn Leu Asp Ser Arg Gly Val Thr Arg Gly Ala Tyr
465                 470                 475                 480

Arg Gly Tyr Gly Asp Val Tyr Asp Val Ser Val Pro Glu Gly Thr Ile
                485                 490                 495

Val Glu Gly Glu Asn Thr Ile Thr Ile Ser Val Ile Ser Gly Ser Ser
            500                 505                 510
```

pectinases.ST251

Gly Asp Asp Phe Leu Ser Pro Asn Phe Leu Asp Ala Val Phe Ile Ile
515 520 525

Ala Leu Val Asp Asn
530

<210> 77
<211> 706
<212> PRT
<213> Aspergillus niger

<400> 77

Met Arg Leu Leu His Pro Leu Ile Pro Ala Ser Leu Leu Leu Thr Leu
1 5 10 15

Thr Ser Ala Thr Leu His Thr Ser Gln Thr Asn Thr Thr Ile Thr Leu
20 25 30

Thr Asn Asn Arg Leu Thr Ala Asn Phe Ser Lys Ser Gln Gly Arg Ile
35 40 45

Thr Asp Leu Tyr Leu Asp Asn Gln Asp Leu Leu Gly Pro Gln Ser Gly
50 55 60

Asp Thr Gly Val Gly Pro Tyr Leu Asp Cys Tyr Cys Ile Pro Ser Gly
65 70 75 80

Phe Tyr Thr Pro Gly Ser Thr Ser Pro Thr Leu Gln Leu Phe Thr Gly
85 90 95

Thr Asp Lys Ser Gly Thr Ser Tyr Ala Gly Val Leu Met Asp Glu Thr
100 105 110

Tyr Pro Pro Thr Gly Gln His Phe Gln Gln Tyr Trp Phe Leu Arg Asp
115 120 125

Gly Glu Thr Gly Leu His Thr Phe Ser Arg Leu Ala Tyr Tyr Asn Glu
130 135 140

Thr Thr Pro Tyr Leu Arg Asn Leu Gln Glu Phe Arg Thr Leu Phe Arg

pectinases.ST251

145 150 155 160

Pro Asn Thr Glu Leu Trp Thr His Leu Ser Ser Ser Glu Val Gln Thr
165 170 175

Ala Pro Leu Pro Ser Lys Lys Ala Val Glu Glu Glu Val Val Val Gln
180 185 190

Asp Ala Thr Trp Thr Phe Asn Asn Thr Pro Thr Asp Glu Tyr Tyr Val
195 200 205

Gln Phe Ala Asp Tyr Phe Thr Lys Tyr Thr Phe Ser Asn Ala Trp Arg
210 215 220

Asp Asn Ser Val His Gly Met Tyr Ala Asp Gly Ser Thr Ser Asn Gly
225 230 235 240

Ser Thr Phe Gly Ala Trp Leu Val Met Asn Thr Lys Asp Thr Tyr Tyr
245 250 255

Gly Gly Pro Leu His Ser Asp Leu Thr Val Asp Gly Ile Val Tyr Asn
260 265 270

Tyr Leu Val Ser Asn His His Gly Glu Gly Thr Pro Asn Ile Thr Tyr
275 280 285

Gly Phe Asp Arg Thr Phe Gly Pro Gln Tyr Tyr His Phe Asn Gly Gly
290 295 300

Lys Gly Ser Thr Ala Ser Leu Gln Glu Leu Lys Ser Asp Ala Glu Thr
305 310 315 320

Leu Ala Asp Pro Ser Trp Asn Val Asp Phe Tyr Asp Ser Ile Ala Lys
325 330 335

His Val Val Gly Tyr Thr Pro Ser Ser Gln Arg Gly Ser Val Gln Gly
340 345 350

Lys Ile Lys Leu Pro Lys Gly Ala Thr Arg Pro Ile Ala Val Leu Thr

pectinases.ST251

355 360 365

Val Asp Gly Gln Tyr Phe Gln Asp Asn Ser Val Asn Ser Ser Ser Tyr
370 375 380

Gln Tyr Trp Ala Glu Ile Asp Asp Ser Gly His Phe Ser Val Asp His
385 390 395 400

Val Lys Glu Gly Pro Tyr Arg Leu Thr Val Tyr Ala Asp Gly Ile Phe
405 410 415

Gly Asp Phe Val Arg Asp Gly Val Gln Val Lys Ala Gly Lys Lys Thr
420 425 430

Thr Ile Gln Glu Thr Trp Glu Ala Glu Ser Ala Gly Thr Glu Ile Trp
435 440 445

Arg Leu Gly Thr Pro Asp Lys Ser Ser Gly Glu Phe Arg His Gly Val
450 455 460

Ala Arg Asp Pro Thr His Pro Leu His Pro Pro Glu Tyr Leu Ile Tyr
465 470 475 480

Trp Gly Ala Tyr Asp Trp Gln Ser Asp Phe Pro Asp Gly Ile Asn Tyr
485 490 495

Thr Ile Gly Thr Ser Asp Pro Ala Thr Asp Leu Asn Thr Val His Trp
500 505 510

Ser Val Phe Gly Pro Thr Pro Asn Asp Pro Arg Val Glu Tyr Asp Thr
515 520 525

Thr His Asp Trp Thr Ile Asn Phe Pro Leu Ser Glu Asp Asp Leu Ala
530 535 540

Glu Arg Ser Lys Ala Thr Leu Thr Ile Gln Leu Ala Gly Ala Lys Ala
545 550 555 560

Ala Ser Gly Asn Thr Asp Val Tyr Asn Ala Ser Glu Pro Tyr Thr Asn

pectinases.ST251

565 570 575

Leu Ala Leu Glu Ser Tyr Ile Asn Asp Gln Ala Glu Pro Leu Thr Leu
580 585 590

Leu Ile Gly Phe Asn Gln Ser Ser Ser Cys Ile Val Arg Ser Ala Val
595 600 605

Ser Cys Tyr Gln Val Arg Ser Arg Met Glu Phe Pro Ala Asp Trp Leu
610 615 620

Lys Val Gly Asn Asn Val Leu Thr Leu His Leu Pro Tyr Asn Ala Thr
625 630 635 640

Asp Thr Glu Thr Ala Ile Leu Pro Ala Thr Val Thr Gly Arg Leu Ile
645 650 655

Leu Pro Pro Gln Pro Ile Tyr Gly Gln Thr Pro Val Ile Leu Ser Val
660 665 670

Ile Gly Ser Glu Lys Leu Glu Pro Leu Pro Ala Ala Ser Ile Leu Ile
675 680 685

Phe Glu Ile Ile Arg His Gln Ser Glu Pro Leu Trp Ser Val Pro Arg
690 695 700

Ser Ala
705

<210> 78
<211> 278
<212> PRT
<213> Aspergillus niger

<400> 78

Met Lys Leu Ser Leu Leu Ser Leu Phe Phe Thr Pro Ile Phe Ala Leu
1 5 10 15

Pro Ser His Leu Thr Pro Arg Asn Asp Ile Pro Pro Phe Phe Leu Leu
20 25 30

pectinases.ST251

```
Ala Gly Asp Ser Thr Thr Ala Val Gln Ser Ser Gly Gly Gly Gly Trp
        35                  40                  45

Gly Asp Gly Phe Ile Asn Thr Thr Leu His Lys Gly Ala Lys Gly Ile
    50                  55                  60

Asn Tyr Gly His Asp Gly Ala Thr Thr Val Ser Phe Arg Ser Gly Gly
65                  70                  75                  80

Asp Trp Ala Thr Val Leu Ser Lys Val Ala Glu Tyr Lys Ser Asp Tyr
                85                  90                  95

Arg Ala Phe Val Thr Ile Gln Phe Gly His Asn Asp Gln Lys Pro Ala
            100                 105                 110

Ala Asn Ile Ser Leu Ala Glu Tyr Thr Ser Asn Leu Glu Gln Phe Ala
        115                 120                 125

Lys Asp Val Lys Asn Ala Gly Gly Thr Pro Ile Leu Val Thr Pro Leu
    130                 135                 140

Ser Arg Arg Asn Tyr Asp Asn Ser Thr Gly Thr Pro Leu Val Ile Glu
145                 150                 155                 160

Asn Leu Ala Asp Gln Arg Ala Ala Thr Ile Asp Ala Ala Lys Asn Thr
                165                 170                 175

Asp Thr Ser Tyr Ile Asp Leu Asn Lys Ala Ser Thr Asp Tyr Leu Asn
            180                 185                 190

Ser Ile Gly Pro Ala Asp Ala Tyr Thr Tyr Asn Leu Ala Ser Asp Asp
        195                 200                 205

Tyr Thr His Leu Asn Gly Glu Gly Ser Ile Val Phe Gly Gly Met Val
    210                 215                 220

Ala Ser Leu Ile Asp Gln Asp Phe Thr Glu Leu Lys Ser Asp Gly Val
225                 230                 235                 240
```

pectinases.ST251

```
Phe Ile His Asp Gln Trp Leu Val Asp Gly Ile Tyr Gln Ala Glu Asn
                245                 250                 255

Asp Ser Cys Tyr Ile Ser Ile Leu Glu Tyr Leu Ser Met Ala Tyr Asp
            260                 265                 270

Leu Ala Asn Pro Met Leu
        275
```

<210> 79
<211> 410
<212> PRT
<213> Aspergillus niger

<400> 79

```
Met Ser Val Phe Lys Ala Ser Phe Leu Phe Leu Leu Ser Ser Ser Leu
1               5                   10                  15

Val His Gly Val Pro His Ser Ser Arg Ala Ser Arg Ser Gln Gln Cys
            20                  25                  30

Val Val Pro Pro Leu His Asn Ala Arg Leu Thr Arg Val Ile Ile Phe
        35                  40                  45

Glu Glu Gly Val Asn Tyr Asn Ile Phe Gln Pro Ile Thr Ala Thr Asn
    50                  55                  60

Leu Ser Asn Val Glu Ile Arg Met His Gly Asn Leu His Leu Pro Gln
65                  70                  75                  80

Asn Ile Thr Ala Val Gln Asn Ile Val Ser Asp Gly Thr Ser Thr Trp
                85                  90                  95

Phe Thr Leu Glu Gly Pro Lys Val Asp Trp Ile Gly Pro Glu Asp Val
            100                 105                 110

Asn Asn Gly Trp Ile Asp Ser Tyr Gly Gln Pro Trp Trp Asp Ala Asn
        115                 120                 125
```

pectinases.ST251

```
Pro Ala Gly Ser Ser Gly Ile Asp Asn Arg Pro His Leu Met Ser Phe
    130                 135                 140

Lys Ser Ser Gln Ala Thr Met Lys Tyr Phe Arg Ser Arg Lys Pro Ile
145                 150                 155                 160

Ala Trp Asn Val Lys Leu His Gly Gln Asp Ile Thr Val Ser His Ala
                165                 170                 175

Ile Ile Asp Ala Thr Ser Thr Gly Ser Phe Pro Phe Asn Thr Asp Gly
            180                 185                 190

Phe Asp Val Glu Gly Thr Asn Ile Gln Ile Thr Asp Ser Ile Met Tyr
        195                 200                 205

Asn Gly Asp Asp Ala Ile Ala Lys His His Arg Leu Pro Asp Ser Arg
    210                 215                 220

His Glu His Gly Ser Leu Gly Lys Asp Pro Thr Asp Phe Ala Asn Ile
225                 230                 235                 240

Ser Asn Ile Arg Phe Asp Asp Val Thr Val Val Asp Gly Leu Tyr Ala
                245                 250                 255

Ala Arg Phe Lys Ser Trp Ser Gly Gly Thr Gly Leu Val Lys Asn Val
            260                 265                 270

Thr Trp Asn Asn Ile Arg Val Phe Asn Val Thr Phe Pro Ile Phe Val
        275                 280                 285

Thr Gln Ser Tyr Ser Asp Gln Gly Ala Ser Arg Ser Gly Thr Val Asn
    290                 295                 300

Ala Ser Ser Ala Val Met Met Glu Asp Phe Thr Trp Ser Asp Phe Ala
305                 310                 315                 320

Gly Ser Ile Asn Thr Tyr Gln Pro Gly Asp Gly Ser Cys Val Ser Asp
                325                 330                 335
```

pectinases.ST251

```
Pro Cys Trp Tyr Asn Val Gly Leu Pro Asn Leu Lys His Thr Glu Ala
            340                 345                 350

Leu Ile Ile Glu Cys His Thr Ala Gln Ser Cys Lys Asn Phe Val Thr
        355                 360                 365

Asp Asn Ile Gln Leu Tyr Pro Gln Val Leu Glu Pro Ala Ser Val Ile
    370                 375                 380

Cys Met Asn Ala Thr Ala Ala Leu Asn Pro Asp Leu Gly Phe Thr Cys
385                 390                 395                 400

Lys Asn Gly Thr Tyr Ser Pro Leu Ser Asn
                405                 410
```

<210> 80
<211> 319
<212> PRT
<213> Aspergillus niger

<400> 80

```
Met Pro Phe Phe Arg Ala Lys Ser Ser Lys Arg Gln Ile Met Phe Val
1               5                   10                  15

Lys Trp His Phe Leu Val Leu Gly Ala Ile Pro Met Ile Pro Ala Tyr
            20                  25                  30

Pro Ser Gly Ala Ala Tyr Lys Gly Gly Phe Glu Trp Asp Ser Thr Lys
        35                  40                  45

Tyr Leu Phe Val Leu Ala Leu Ile Asp Gly Arg Ile Trp Arg Ser Glu
    50                  55                  60

Gly Gly Pro Asn Trp Val Glu Tyr Leu Thr Gly Cys Gly Leu Glu Glu
65                  70                  75                  80

Gly Leu Thr Ser Pro Phe Asp Cys Asp Gln Gln Leu Trp Asp Phe Ala
                85                  90                  95
```

pectinases.ST251

Phe Ala Gly Ser Asp Ile Ser Val Glu Tyr Thr Pro Leu His His Asn
100 105 110

Phe Thr Val Ser Leu Val Asn Gln Val Lys Gln Phe Asn Thr Tyr Ala
115 120 125

Gln Pro Val Leu Lys Lys Thr Val Asp Gln Ser His Ala Leu Val Ala
130 135 140

Ile Trp Ile Gly Ile Asn Asp Ile Gly Asp Ser Ser Lys Tyr Asp Val
145 150 155 160

Asp Phe Pro Thr Phe Tyr Asn Glu Leu Met Asn Thr Leu Phe Ser Ser
165 170 175

Val Gln Thr Ile Tyr Ser Gln Gly Tyr Arg Ser Tyr Leu Phe Met Asn
180 185 190

Leu Pro Pro Leu Asp Arg Arg Pro Gly Asn Leu Gly Ser Ala Asp Pro
195 200 205

Ser Pro Asn Ala Thr Gln Ile Thr Trp Tyr Asn Asp Ala Leu Ala Gln
210 215 220

His Ala Ser Ala Phe His Asp Arg Tyr Ala Asp Thr Asn Val Met Leu
225 230 235 240

Phe Asp Ala His Ser Glu Leu Ser Tyr Ile Leu Asp Asn Pro Gly Asp
245 250 255

Phe Gly Ile Val Asn Ile Thr Asn Phe Cys Ala Gly Tyr Asp Gln Pro
260 265 270

Asp Ile Ala Trp Asn Tyr Gln Ala Tyr Gly Cys Pro Thr Pro Leu Asp
275 280 285

Thr Tyr Phe Trp Tyr Asn Ser Gly His Met Thr Ser His Val His Glu
290 295 300

pectinases.ST251

Ile Leu Ala Gly Ala Val Glu Arg Lys Leu Glu Glu Trp Ser Asp
305 310 315

<210> 81
<211> 317
<212> PRT
<213> Aspergillus niger

<400> 81

Met Thr Gly Ile Pro Thr Val Thr Ala Arg Pro Trp Thr Gln Arg Pro
1 5 10 15

Arg Ala Glu Asn Ser Thr Thr Asn Pro Thr Tyr Phe Phe Thr Leu Cys
20 25 30

Ala Gln Pro Phe Pro Ser Thr Pro Pro Thr His Ile Thr Asn Asn Ile
35 40 45

Asp Asp Glu Gly Ile Gly Thr Thr Thr Asn Gly Pro Asn Trp Ile Gly
50 55 60

Tyr Leu Thr Thr Thr Glu Asn Ala Ser Leu Val Leu Ser Tyr Asn Leu
65 70 75 80

Ala Ala Gly Gly Ala Thr Ile Asp Asn Ala Leu Val Pro Ala Tyr Pro
85 90 95

Gly Asp Leu Ala Ser Gln Phe Arg Leu Phe Glu Asp Val Tyr Ala Asp
100 105 110

Lys Pro Ala Ser Ala Pro Trp Ser Ala Glu Asp Ala Val Phe Gly Val
115 120 125

Trp Ile Gly Ile Asn Glu Tyr Ile Leu Pro Pro Pro Pro Pro Pro Pro
130 135 140

Pro Pro Pro Pro Pro Leu Leu Leu His Ser Pro Asp Cys Pro Tyr Thr
145 150 155 160

Gly Gly Gly Cys Tyr Ile Gly Asn Ala Tyr Tyr Ser Thr Asp Ala Glu

pectinases.ST251

165 170 175

Thr Tyr Thr Pro Lys Leu Ile Ser Arg Leu Glu Ser Leu Val Glu Glu
180 185 190

Val Tyr Lys Asn Gly Gly Arg Lys Phe Leu Phe Leu Asn Val Pro Pro
195 200 205

Thr Ser Arg Ser Pro Leu Phe Leu Glu Gln Gly Glu Glu Val Val Lys
210 215 220

Gln His Ala Glu Tyr Leu Ser Val Tyr Asn Glu Asn Leu Glu Gly Met
225 230 235 240

Val Asp Asp Phe Thr Lys Lys Lys Gly Asp Val Thr Thr Val Leu Tyr
245 250 255

Asp Ser Trp Ser Phe Met Thr Lys Ile Leu Asp Asp Pro Thr Ala Tyr
260 265 270

Gly Phe Pro Asp Ala Thr Cys Ile Asn Asp Asp Gly Thr Ser Cys Ile
275 280 285

Trp Trp Asn Asn Tyr His Pro Gly Met Lys Tyr His Leu Leu Gln Ala
290 295 300

Glu Asp Met Lys Pro Lys Leu Arg Lys Leu Gly Gly Trp
305 310 315

<210> 82
<211> 536
<212> PRT
<213> Aspergillus niger

<400> 82

Met Asp Phe Pro Arg Leu Leu Leu Ala Leu Cys Phe Leu Leu Thr Phe
1 5 10 15

Ser Leu Thr Ser Ala Tyr Asp Ala Pro Leu Val Thr Leu Asp Tyr Gly
20 25 30

pectinases.ST251

```
Thr Phe Gln Gly Ser Tyr Asp Ala Thr Tyr Asn Leu Ser Tyr Phe Arg
        35                  40                  45

Lys Ile Pro Phe Ala Ala Pro Ala Thr Gly Glu Asn Arg Phe Arg Ala
    50                  55                  60

Pro Gln Pro Pro Leu Asn Ile Thr Asn Gly Thr Tyr Asp Thr Asp Gln
65                  70                  75                  80

Ser Phe Asp Met Cys Pro Gln Arg Thr Val Asn Gly Ser Glu Asp Cys
                85                  90                  95

Leu Tyr Leu Gly Leu Tyr Ser Arg Pro Trp Asp Thr Ser Ser Ser Thr
            100                 105                 110

Thr Ser Arg Pro Val Leu Val Val Phe Tyr Gly Gly Gly Phe Ile Glu
        115                 120                 125

Gly Asp Ala Leu Phe Gly Met Pro Pro Asn Ala Tyr Pro Val Leu Asn
    130                 135                 140

Val Ser Thr Leu Asn Asp Tyr Ile Val Val Tyr Thr Asn Tyr Arg Val
145                 150                 155                 160

Asn Ala Phe Gly Phe Leu Pro Gly Gln Ala Ile Lys Asp Ser Pro Thr
                165                 170                 175

Ser Asp Leu Asn Pro Gly Leu Leu Asp Gln Gln Tyr Ala Leu Lys Trp
            180                 185                 190

Val Lys Ser His Ile His Arg Phe Gly Gly Asn Pro Asn Asn Val Thr
        195                 200                 205

Ile Trp Gly Gln Ser Ala Gly Gly Gly Ser Val Val Ala Gln Ile Leu
    210                 215                 220

Ala Asn Gly Arg Gly Ser Asn Pro Lys Leu Phe Ser Lys Ala Leu Ala
225                 230                 235                 240
```

pectinases.ST251

```
Ser Ser Pro Phe Trp Pro Lys Thr Tyr Ala Tyr Asn Ala Pro Gln Ala
                245                 250                 255

Glu Ala Ile Tyr Thr Gln Leu Val Asn Leu Thr Asn Cys Thr Thr Ala
            260                 265                 270

Ser Asp Thr Leu Lys Cys Leu Lys Glu Val Asp Val Gln Ser Ile Arg
        275                 280                 285

Asp Ala Ser Leu Ile Ile Asp Ala Asp Asn Thr Tyr Thr Thr Ser Ser
    290                 295                 300

Tyr Thr Trp Ala Pro Val Ile Asp Gly Thr Phe Leu Ile Glu Pro Leu
305                 310                 315                 320

Thr Ser Ala Thr Ala Ser Asn Thr Leu Lys Thr Asp Leu Ile Trp Gly
                325                 330                 335

Met Tyr Asn Ala His Glu Gly Glu Asn Phe Ile Pro Pro Gly Leu Glu
            340                 345                 350

Asp Thr Thr Thr Thr Asn Gly Phe Asn Ser Ser Leu Ala Ser Phe His
        355                 360                 365

Asn Trp Leu Thr Gly Phe Leu Pro Gly Leu Asp Thr Ser Asp Ile Asn
    370                 375                 380

Leu Ile Glu Ser Lys Tyr Tyr Pro Val Ser Gly Thr Ala Glu Thr Leu
385                 390                 395                 400

Ser Tyr Asn Thr Thr Phe Val Arg Ala Gly Leu Val Tyr Arg Asp Val
                405                 410                 415

Val Leu Ala Cys Pro Ala Tyr Trp Val Ala Ser Ala Ala Gly Glu Lys
            420                 425                 430

Gly Tyr Val Gly Glu Tyr Thr Ile Pro Pro Ala Arg His Gly Ser Asp
        435                 440                 445
```

pectinases.ST251

```
Thr Glu Trp Trp Asp Thr Val Ser Thr Val Gln Gln Thr Asp Pro Leu
    450                 455                 460

Ile Tyr Asp Gly Tyr Ala Gly Ala Phe Ala Ser Phe Phe Gln Thr Gly
465                 470                 475                 480

Asp Pro Asn Ala His Lys Leu Thr Asn Gly Ser Glu Pro Gly Val Pro
                485                 490                 495

Glu Val Gln Gln Thr Ala Glu Glu Phe Val Ile Ala Thr Glu Gly Phe
            500                 505                 510

Glu Asn Val Gly Leu Gly Glu Leu Glu Asp Arg Cys Ala Phe Trp Lys
        515                 520                 525

Ser Val Gly Lys Lys Ile Pro Ile
    530                 535
```

<210> 83
<211> 378
<212> PRT
<213> Aspergillus niger

<400> 83

```
Met Val Thr Ser Ser Ser Val Ile Val Leu Thr Leu Trp Ala Ala Leu
1               5                   10                  15

Val Ser Ala Ser Pro Val Ala Asp Pro Leu Val Thr Pro Ala Pro Lys
            20                  25                  30

Leu Glu Asp Leu Glu Lys Arg Ala Thr Ser Cys Thr Phe Ser Gly Ser
        35                  40                  45

Glu Gly Ala Ser Ser Ala Ser Lys Ser Lys Thr Ser Cys Ser Thr Ile
    50                  55                  60

Val Leu Ser Asp Val Ala Val Pro Ser Gly Thr Thr Leu Asp Leu Thr
65                  70                  75                  80
```

pectinases.ST251

```
Asp Leu Asn Asp Gly Thr His Val Ile Phe Glu Gly Glu Thr Thr Phe
                85                  90                  95

Gly Tyr Glu Glu Trp Ser Gly Pro Leu Val Ser Val Ser Gly Thr Asp
            100                 105                 110

Ile Thr Val Thr Gly Ala Asp Gly Ala Tyr Leu Asn Gly Asp Gly Ser
        115                 120                 125

Arg Trp Trp Asp Gly Glu Gly Ser Asn Gly Gly Lys Thr Lys Pro Lys
    130                 135                 140

Phe Phe Tyr Ala His Asp Leu Thr Ser Ser Thr Ile Ser Gly Ile Tyr
145                 150                 155                 160

Ile Gln Asn Ser Pro Val Gln Val Phe Ser Ile Asp Gly Ser Thr Tyr
                165                 170                 175

Leu Thr Met Glu Asp Ile Thr Ile Asp Asn Thr Asp Gly Asp Asp Gly
            180                 185                 190

Glu Ala Ala Asn Thr Asp Gly Phe Asp Ile Gly Asp Ser Thr Tyr Ile
        195                 200                 205

Thr Ile Thr Gly Ala Asn Val Tyr Asn Gln Asp Asp Cys Val Ala Val
    210                 215                 220

Asn Ser Gly Glu Asn Ile Tyr Phe Ser Gly Gly Val Cys Ser Gly Gly
225                 230                 235                 240

His Gly Leu Ser Ile Gly Ser Val Gly Gly Arg Ser Asp Asn Thr Val
                245                 250                 255

Lys Asn Val Thr Phe Tyr Asp Ser Glu Ile Lys Ser Ser Gln Asn Gly
            260                 265                 270

Val Arg Ile Lys Thr Ile Tyr Gly Asp Thr Gly Ser Val Ser Glu Val
        275                 280                 285
```

pectinases.ST251

```
Thr Tyr Lys Glu Ile Thr Leu Ser Asp Ile Thr Asp Tyr Gly Ile Val
    290                 295                 300

Val Glu Gln Asn Tyr Asp Asp Thr Ser Lys Ser Pro Thr Asp Gly Ile
305                 310                 315                 320

Thr Ile Glu Asp Phe Val Leu Asp Asn Val Gln Gly Ser Val Glu Ser
                325                 330                 335

Ser Gly Thr Asn Ile Tyr Ile Val Cys Gly Ser Asp Ser Cys Thr Asp
            340                 345                 350

Trp Thr Trp Thr Asp Val Asp Val Ser Gly Gly Lys Thr Ser Ser Asp
        355                 360                 365

Cys Glu Asn Val Pro Asp Asp Ile Ser Cys
    370                 375
```

<210> 84
<211> 558
<212> PRT
<213> Aspergillus niger

<400> 84

```
Met Leu Leu Asp Lys Leu Ser Val Leu Ser Phe Leu Gly Leu Ala Pro
1               5                   10                  15

Ile Phe Ala Ala Ala Gln Leu Ser Gly Ser Val Gly Pro Leu Thr Ser
            20                  25                  30

Ala Ser Thr Lys Ala Ala Thr Lys Thr Cys Asn Val Leu Asp Tyr Gly
        35                  40                  45

Ala Lys Ala Asp Lys Ser Thr Asp Leu Gly Ala Pro Leu Ala Ser Ala
    50                  55                  60

Phe Ala Asp Cys Lys Ser Gly Gly Leu Val Tyr Val Pro Ser Gly Asp
65                  70                  75                  80
```

pectinases.ST251

```
Tyr Ala Leu Ser Thr Trp Ala Arg Leu Ser Gly Gly Glu Ala Trp Ala
                85                  90                  95

Leu Gln Ile Asp Gly Ile Ile Tyr Arg Thr Gly Thr Asp Gly Gly Asn
            100                 105                 110

Met Ile Tyr Ile Glu His Ser Ser Asp Phe Glu Leu Phe Ser Ser Thr
        115                 120                 125

Ser Glu Gly Ala Met Gln Gly Leu Gly Tyr Glu Phe His Ala Asp Asp
    130                 135                 140

Asn Trp Ser Gly Pro Arg Leu Leu Arg Leu Tyr Glu Val Thr Asp Phe
145                 150                 155                 160

Ser Val His Asp Phe Ile Leu Val Asp Ser Pro Ser Phe His Phe Ser
                165                 170                 175

Leu Asp Thr Cys Thr Asn Gly Glu Ile Tyr Asn Met Ala Ile Arg Gly
            180                 185                 190

Gly Asn His Gly Gly Leu Asp Gly Ile Asp Val Trp Ser Asn Asn Ile
        195                 200                 205

Trp Val His Asp Val Glu Val Thr Asn Lys Asp Glu Cys Val Thr Val
    210                 215                 220

Lys Ser Pro Ser Lys Asn Ile Leu Ile Glu Ser Ile Tyr Cys Asn Trp
225                 230                 235                 240

Ser Gly Gly Cys Gly Met Gly Ser Phe Gly Ser Asp Thr Asn Val Ser
                245                 250                 255

Asp Ile Thr Tyr Arg Asn Ile Tyr Thr Trp Ser Ser Asn Asn Met Met
            260                 265                 270

Leu Ile Lys Ser Asn Gly Gly Ser Gly Phe Val Glu Asn Val Leu Leu
        275                 280                 285
```

pectinases.ST251

Glu Asn Phe Ile Gly His Gly Asn Ala Tyr Ser Leu Asp Ile Asp Ser
290 295 300

Tyr Trp Ala Ser Met Ser Ala Val Asp Gly Asp Gly Val Gln Leu Ser
305 310 315 320

Asn Ile Thr Val Lys Asn Trp Lys Gly Thr Glu Ala Tyr Gly Ala Glu
325 330 335

Arg Gly Pro Val Lys Val Val Cys Ala Asp Gly Ala Pro Cys Tyr Asp
340 345 350

Ile Thr Ile Glu Asp Phe Ala Met Trp Thr Glu Glu Gly Asp Ser Gln
355 360 365

Trp Tyr Ser Cys Glu Ser Ala Tyr Gly Ser Gly Tyr Cys Leu Gln Asp
370 375 380

Ser Asp Asp His Val Ser Tyr Ser Val Thr Thr Ser Thr Val Ser Ser
385 390 395 400

Ala Pro Ser Gly Tyr Ser Ala Thr Ser Met Ala Ala Asp Leu Thr Thr
405 410 415

Asp Phe Gly Ser Thr Val Ser Ile Pro Ile Pro Thr Ile Pro Thr Ser
420 425 430

Phe Tyr Pro Gly Ala Thr Pro Tyr Ser Ala Leu Met Ala Asn Ser Ala
435 440 445

Ser Thr Ala Ala Ala Ser Ser Ile Ala Ser His Ala Thr Val His Ser
450 455 460

Ser Ser Ala Ser Val Ala Ala Ser Val Pro Ser Ala Val Ala Pro Ser
465 470 475 480

Glu Ser Ile Pro Ala Ala Thr Ser Ala Val Val Ser Ser Ala Ala Ala
485 490 495

pectinases.ST251

Ile Ala Pro Ser Pro Ala Val Gly Ala Gln Glu Gly Ser Thr Thr Ser
500 505 510

Ala Pro Ser Phe Ala Ala Pro Ser Gly Ala Gly Asn Ser Pro Gln Gly
515 520 525

Pro Thr Gly Ala Ser Gly Phe Gly Glu Lys Gly Gln Gln Gly Glu Gln
530 535 540

Gly Glu Gln Gly Glu Gln Gly Glu Gln Gly Val Cys Tyr Val
545 550 555

<210> 85
<211> 350
<212> PRT
<213> Aspergillus niger

<400> 85

Met Ile Tyr Ser Leu Leu Leu Ser Ala Leu Pro Leu Leu Ser Ser Ala
1 5 10 15

Ala Leu Thr Tyr Arg Gly Ala Asp Ile Ser Ser Leu Leu Ile Glu Glu
20 25 30

Asp Ala Gly Ile Ser Tyr Lys Asn Leu Asn Gly Glu Thr Gln Ala Leu
35 40 45

Glu Asp Ile Leu Val Asn Asn Gly Val Asn Ser Ile Arg Gln Arg Val
50 55 60

Trp Val Asp Pro Ser Asp Gly Ser Tyr Asp Leu Asp Tyr Asn Leu Lys
65 70 75 80

Leu Ala Lys Arg Val Gln Ala Ala Gly Met Ser Ile Tyr Leu Asp Leu
85 90 95

His Leu Ser Asp Thr Trp Ala Asp Pro Ser Asp Gln Thr Thr Pro Thr
100 105 110

Gly Trp Ser Thr Thr Asp Ile Asp Thr Leu Thr Trp Gln Leu Tyr Asn

pectinases.ST251

```
        115                 120                 125

Tyr Thr Leu Asp Val Cys Asn Thr Phe Ala Glu Asn Asp Ile Asp Ile
    130                 135                 140

Glu Ile Val Ser Ile Gly Asn Glu Ile Ser Ser Gly Leu Leu Trp Pro
145                 150                 155                 160

Leu Gly Lys Thr Ser Asn Tyr Asp Asn Ile Ala Lys Leu Leu His Ser
                165                 170                 175

Gly Ala Trp Gly Val Lys Asp Ser Asn Gln Ala Thr Thr Pro Lys Ile
            180                 185                 190

Met Ile His Leu Asp Asn Gly Trp Asp Trp Glu Glu Gln Glu Tyr Phe
        195                 200                 205

Tyr Lys Thr Val Leu Ala Thr Gly Ser Leu Leu Ser Thr Asp Phe Asp
    210                 215                 220

Leu Met Gly Val Ser Tyr Tyr Pro Phe Tyr Ser Ser Glu Ala Thr Leu
225                 230                 235                 240

Ser Ala Leu Gln Thr Ser Leu Thr Asn Met Gln Ser Asn Tyr Asp Lys
                245                 250                 255

Ser Val Val Val Val Glu Thr Asn Trp Pro Val Ser Cys Pro Asp Pro
            260                 265                 270

Glu Tyr Ser Phe Pro Ser Asp Leu Ser Ser Ile Pro Phe Ser Ala Ala
        275                 280                 285

Gly Gln Glu Glu Phe Leu Glu Lys Leu Ala Glu Val Val Glu Gly Val
    290                 295                 300

Thr Asp Gly Leu Gly Ile Tyr Tyr Trp Glu Pro Ala Trp Val Asp Asn
305                 310                 315                 320

Ala Ala Leu Gly Ser Ser Cys Ala Asp Asn Leu Met Val Asp Ile Asp
```

pectinases.ST251

325 330 335

Thr Asp Glu Val Leu Glu Ser Val Thr Val Phe Glu Asp Leu
340 345 350

<210> 86
<211> 476
<212> PRT
<213> Aspergillus niger

<400> 86

Met Thr Leu Leu Arg His Leu Leu Thr Ala Thr Ala Leu Leu Gly Ala
1 5 10 15

Ser Val Gln Ala Ala Gln Gly Val Thr Gly Ser Pro Phe Gly Phe Ala
20 25 30

Ser Gly Thr Thr Gly Gly Gly Asp Ala Thr Pro Ala Ala Pro Ser Asp
35 40 45

Ile Ser Gln Leu Lys Thr Trp Leu Ser Asp Ser Thr Pro Arg Val Ile
50 55 60

Leu Ile Asp Lys Glu Phe Asn Phe Leu Gly Ser Glu Gly Lys Cys Thr
65 70 75 80

Asn Cys Glu Cys Cys Lys Pro Ala Ser Asn Thr Cys Gly Ser Ser Gly
85 90 95

Gln Asn Ala Val Lys Gln Asn Gly Ser Asp Trp Cys Gly Ser Tyr Pro
100 105 110

Thr Leu Thr Cys Thr Tyr Asp Asn Ala Gly Ile Glu Gly Leu Glu Val
115 120 125

Ala Ser Asn Lys Ser Ile Val Gly Val Gly Ser Ser Gly Val Leu Arg
130 135 140

Gly Lys Gly Leu Arg Leu Val Asn Gly Val Ser Asn Ile Ile Ile Gln
145 150 155 160

pectinases.ST251

```
Asn Ile His Ile Thr Glu Leu Asn Pro Glu Phe Ile Trp Gly Gly Asp
                165                 170                 175

Ala Ile Thr Leu Asp Gly Thr Asn Asn Val Trp Ile Asp His Val Lys
            180                 185                 190

Ile Asn Leu Ile Gly Arg Gln Met Phe Val Ala Gly Tyr Glu Ala Ser
        195                 200                 205

His Ser Val Thr Ile Ser Asn Ser Glu Phe Asp Gly Glu Thr Ser Trp
    210                 215                 220

Ser Ala Thr Cys Asp Gly His His Tyr Trp Thr Val Leu Gly Tyr Gly
225                 230                 235                 240

His Asn Asp Lys Ile Thr Phe Ala Asn Asn Tyr Ile His His Thr Ser
                245                 250                 255

Gly Arg Ser Pro Lys Leu Glu Phe Asn Ser Phe Trp His Ala Tyr Asn
            260                 265                 270

Asn Tyr Trp Tyr Asn Asn Thr Gly His Ala Phe Asp Val Gly Lys Asn
        275                 280                 285

Thr Arg Ala Leu Ile Glu Gly Asn Val Met Val Gln Val Asp Thr Pro
    290                 295                 300

Leu Leu Ala Asp Ser Asn Pro Gly Ala Val Phe Ala Val Asn Thr Ser
305                 310                 315                 320

Asp Val Ser Thr Cys Thr Ser Thr Leu Gly Arg Thr Cys Val Pro Asn
                325                 330                 335

Thr Leu Ile Ser Ser Gly Thr Leu Ser Gly Ser Asp Ser Ser Val Ile
            340                 345                 350

Ser Ser Trp Pro Ser Gly Glu Ser Asp Val Thr Val Met Ala Ala Ser
        355                 360                 365
```

pectinases.ST251

```
Lys Val Ala Ser Tyr Val Lys Ala Asn Ala Gly Ile Gly Lys Leu Gly
    370                 375                 380

Asn Gly Ser Gly Ser Ser Ser Thr Val Gly Ala Ala Ala Thr Ser Ala
385                 390                 395                 400

Val Ala Lys Arg Ala Asp Ser Asp Asp Ala Pro Phe Val Pro Ala Tyr
                405                 410                 415

Ser Glu Ala Gly Pro Gly Ala Ser Ala Val Pro Thr Gln Pro Ser Trp
            420                 425                 430

Ser Trp Arg Thr Val Thr Asn Gly Pro Ala Pro Thr Gly Ala Pro Ser
        435                 440                 445

Asp Ser Pro Ser Ala Pro Gln Gly Leu Gly Ala Pro Val Gln Ala Ser
    450                 455                 460

Asn Lys His His His Gln Gly His Gly Arg Gly Tyr
465                 470                 475
```

<210> 87
<211> 437
<212> PRT
<213> Aspergillus niger

<400> 87

```
Met Thr Pro Asn Trp Ser Lys Leu Trp Thr Phe Ile Ala Asn Pro Lys
1               5                   10                  15

Asp Pro Ser Ser Ser Ser Pro Ser Pro Tyr Thr Leu Arg Arg Ile Ile
            20                  25                  30

Lys Ser Leu Ser Leu Leu Thr Val Phe Ser Ile Phe Leu Tyr Ala Leu
        35                  40                  45

Tyr Ile His Phe Gln Pro Ser Ile Ile Pro Gln Thr Pro Asp Leu Pro
    50                  55                  60
```

pectinases.ST251

```
Asp Pro Asp Leu Pro Pro Ser Pro Glu Asp Ser Tyr Lys Ser Ile Tyr
65                  70                  75                  80

Gly Tyr Pro Pro Thr Asn Pro Thr Ile Pro Pro Leu His Ile His Asp
                85                  90                  95

Pro Ser Ile Leu Tyr Asp Leu Pro Thr Asn Thr Tyr Tyr Ala Tyr Gly
            100                 105                 110

Ser Gly Pro His Ile Pro Ile His Ser Ala Pro Thr Leu Gln Gly Pro
        115                 120                 125

Trp Thr Lys Val Gly Thr Val Leu Asp Ala Asp Ser Ile Leu Pro Lys
    130                 135                 140

Gly Asp Arg Lys Ala Pro Trp Ala Pro Thr Ala Leu Val His Asp Gly
145                 150                 155                 160

Thr Phe Tyr Val Phe Tyr Ala Thr Ser His Ser Gly Cys Arg Asp Ser
                165                 170                 175

Ala Ile Gly Val Ala Thr Ser Thr Ser Pro Gly Pro Gly Gly Trp Glu
            180                 185                 190

Asp His Gly Ala Ile Ala Ile Ser Gly Arg Gly Glu Arg Gly Lys Glu
        195                 200                 205

Tyr Pro Phe Asp Arg Ala Asn Ala Ile Asp Val Ser Val Val Val Asp
    210                 215                 220

Tyr Thr Asp Thr Gln Thr Gln Thr Glu Pro Ser Glu Gly Glu Ile Ser
225                 230                 235                 240

Leu Glu Glu Gly Lys Lys Gly Lys Gly Arg Gly Tyr Met Thr Phe Gly
                245                 250                 255

Ser Phe Trp Thr Gly Ile Trp Gln Val Pro Leu Lys Pro Asn Leu Leu
            260                 265                 270
```

pectinases.ST251

```
His Met Asp Lys Gln Gly Glu Glu Glu Lys Arg Val Lys His Leu Ala
        275                 280                 285

His Glu Pro Ala Ala Ile His Pro Pro Thr Lys Lys Ala Asp Gly Leu
    290                 295                 300

Cys Gly Asp Thr Thr Gly Met His Pro Ile Glu Gly Ala Phe Ile Ser
305                 310                 315                 320

Tyr His Glu Pro Trp Trp Tyr Leu Trp Phe Ser Trp Gly Lys Cys Cys
                325                 330                 335

His Phe Asp Pro Glu Lys Leu Pro Arg Ala Gly Leu Asp Ile Arg Val
            340                 345                 350

Gly Arg Ser Ser Ser Pro Gln Gly Pro Phe Val Asp Lys Glu Gly Lys
        355                 360                 365

Asp Leu Val Asp Gly Gly Gly Glu Ile Val Tyr Gly Ser Asn Gly Asp
    370                 375                 380

Val Tyr Ala Pro Gly Gly Gln Gly Val Leu Ser Gly Glu Val Glu Gly
385                 390                 395                 400

Asp Val Leu Tyr Tyr His Tyr Leu Asn Ile Ser Val Gly Tyr Glu Phe
                405                 410                 415

Lys Glu Ala Arg Leu Gly Tyr Asn Tyr Leu Lys Tyr Val Asp Gly Trp
            420                 425                 430

Pro Val Pro Leu Ser
        435
```

<210> 88
<211> 366
<212> PRT
<213> Aspergillus niger

<400> 88

pectinases.ST251

```
Met Leu Pro Ser Leu Leu Ser Val Leu Phe Phe Leu Leu Tyr Ala Val
1               5                  10                  15

Asn Ala Val Pro Leu Ala Pro Arg Ala Ser Ala Leu Ala Gly Ile Asp
            20                  25                  30

Thr Lys Ser Phe Ser Lys Thr Lys Asp Tyr Pro Leu Pro Asn Leu Gly
        35                  40                  45

Asn Ile Val Ala His Asp Pro Asn Val Ile Gln His Asp Gly Tyr Phe
    50                  55                  60

Tyr Leu Tyr Lys Gly Gly Val His Ile Pro Ile His Arg Ala Arg Ser
65                  70                  75                  80

Leu Ser Gly Pro Trp Glu Gln Val Gly Thr Val Leu Asp Asp Ser Ser
                85                  90                  95

Val Ile Pro Lys Gln Asn Arg Ser Arg Pro Trp Ala Pro Thr Thr Ile
            100                 105                 110

Gln His Asp Asn Arg Phe Tyr Cys Phe Tyr Ala Ile Ser Glu Asn Gly
        115                 120                 125

Ser Arg Asp Ser Ala Ile Gly Val Ala Ser Ser Asp Thr Pro Val Gly
    130                 135                 140

Gly Asn Trp Thr Asp His Gly Ala Val Val Asn Thr Gly Lys Gly Asp
145                 150                 155                 160

Leu Ser Asp Ile Tyr Pro Tyr Ser Val Ser Asn Ala Ile Asp Gly Ala
                165                 170                 175

Phe Ile Thr Asp Gln Gln Thr Gly Gln Ser His Leu Leu Tyr Gly Ser
            180                 185                 190

Tyr Trp His Gly Ile Phe Ser Val Pro Leu Ala Asp Asp Leu Leu Ser
        195                 200                 205
```

pectinases.ST251

Val Lys Thr Pro Lys Thr Pro Asn Ala Thr Asn Leu Ala Tyr Ile Pro
210 215 220

Asp Ala Lys Ser Lys Pro Ile Glu Gly Ser Phe Met Thr Tyr Lys Ala
225 230 235 240

Pro Tyr Tyr Tyr Leu Trp Phe Ser His Gly Lys Cys Cys His Phe Asp
245 250 255

Ile His Ala Phe Pro Pro Met Gly Asp Glu Tyr Asn Ile Arg Val Gly
260 265 270

Arg Ser Lys Ser Ala Thr Gly Pro Phe Val Asp Lys Asp Gly His Asp
275 280 285

Thr Leu Lys Gly Gly Gly Thr Ile Val Tyr Gly Ser Asn His Gly Ile
290 295 300

Val Tyr Ala Pro Gly Gly Val Gly Val Leu Ile Asn Asn Gly Ser Glu
305 310 315 320

Ala Asp Val Leu Tyr Tyr His Tyr Leu Asn Thr Thr Ser Gly Phe Ala
325 330 335

Gln Gly Asp Ala His Leu Gly Trp Asn Tyr Leu His Tyr Val Asn Gly
340 345 350

Trp Pro Val Ala Val Glu Gly Tyr Val Asn Ala Asn Gly Lys
355 360 365

<210> 89
<211> 318
<212> PRT
<213> Aspergillus niger

<400> 89

Met Leu Ser Phe Val Leu Leu Leu Cys Val Ala Leu Val Asn Ala Tyr
1 5 10 15

Ser Asp Pro Gly Ala Cys Ser Gly Thr Cys Trp Ala His Asp Pro Asn

pectinases.ST251

20 25 30

Val Ile Arg Arg Val Ser Asp Gly Thr Tyr Phe Arg Phe Ser Thr Gly
35 40 45

Gly Gly Val His Ile Ser Ser Ala Ser Ala Ile Thr Gly Pro Trp Thr
50 55 60

Asp Leu Gly Tyr Ala Leu Pro Asn Gly Ser Ile Val Thr Val Gly Asn
65 70 75 80

Ala Ser Asn Leu Trp Ala Pro Asp Val His Tyr Val Asp Gly Thr Tyr
85 90 95

Tyr Met Tyr Tyr Ala Ser Ser Thr Leu Gly Ser Arg Asp Ser Thr Ile
100 105 110

Gly Val Ala Thr Ser Thr Thr Leu Glu Ala Asp Ser Trp Thr Asp His
115 120 125

Gly Glu Ile Gly Val Thr Ser Ser Ser Ser Thr Pro Tyr Asn Ala Ile
130 135 140

Asp Pro Asn Trp Ile Thr Ile Gly Ser Thr Pro Tyr Leu Gln Phe Gly
145 150 155 160

Ser Tyr Trp Gln Gly Leu Tyr Gln Val Glu Met Thr Asp Ser Leu Ser
165 170 175

Ala Ser Ser Ser Thr Pro Thr Asn Leu Ala Tyr Asn Ala Ser Gly Asn
180 185 190

His Ala Ile Glu Ala Ser Tyr Leu Tyr Glu Tyr Gly Gly Tyr Tyr Tyr
195 200 205

Leu Thr Phe Ser Ser Gly Lys Ala Gln Gly Tyr Thr Thr Ser Leu Pro
210 215 220

Ala Gln Gly Asp Glu Tyr Arg Ile Val Val Cys Arg Ser Lys Thr Gly

pectinases.ST251

225 230 235 240

Thr Gly Asn Phe Val Asp Lys Asp Gly Val Ser Cys Leu Asn Ser Gly
245 250 255

Gly Thr Thr Val Leu Ala Ser His Asp Tyr Val Tyr Gly Pro Gly Gly
260 265 270

Gln Gly Ile Ile Asn Thr Thr Ser His Gly Ile Val Val Tyr Tyr His
275 280 285

Tyr Ala Asn Lys Asn Ile Gly Leu Ala Val Asp Asp Tyr Gln Phe Gly
290 295 300

Trp Asn Thr Leu Thr Trp Thr Asp Gly Trp Pro Val Val Ala
305 310 315

<210> 90
<211> 494
<212> PRT
<213> Aspergillus niger

<400> 90

Met Leu Thr Ser Gln Pro Leu Ser Pro Asn Cys Pro His Arg Arg Ala
1 5 10 15

Tyr His His Leu Pro Ser Leu Leu Glu Val Leu Ile His Ser Pro His
20 25 30

Glu Pro Leu Ser Leu Thr Leu Lys Thr Leu Tyr Leu Phe Ser Thr Asn
35 40 45

Gly Ser Pro His Trp Leu Ser Tyr Leu Thr Pro Gln Pro Ser Pro Leu
50 55 60

Thr Thr Lys His Arg Val Val Asn Asp Thr Leu Gln Ser Glu Asp Tyr
65 70 75 80

Ser Leu Val Arg Ala Arg Gly Trp Gln His Pro Arg Lys Tyr Ile Gln
85 90 95

pectinases.ST251

```
Val Asp Thr Met Lys Gly Leu Pro Ser Leu Leu Asn Ser Ser Ser Thr
            100                 105                 110

Lys Lys Trp Thr Gln Ser Thr Pro Ser Thr Gly Glu Gly Glu Asn Glu
        115                 120                 125

Ser Gly Ser Thr Ile Ser Pro Thr Lys Pro Pro Glu Pro Ser Thr Pro
    130                 135                 140

Pro Gly Gly Ser Asn Thr Ser Met Ile Trp Thr Arg Lys Lys Ile Ile
145                 150                 155                 160

Trp Leu Ile Thr Leu Ile Ala Leu Ser Val Ala Ile Ile Val Val Val
                165                 170                 175

Ile Thr Val Pro Val Val Leu Leu Leu Asp Asp Lys His Asn Asp Asp
            180                 185                 190

Pro Ser Tyr Tyr Asn Ser Ala Asn Arg Pro Val Arg Val Val His Asp
        195                 200                 205

Phe Pro Asp Pro Gly Leu Ile Gln Val Asn Ser Thr Trp Tyr Ala Tyr
    210                 215                 220

Ala Thr Val Ala Thr Pro Asp Asn Pro Asp Val Pro His Val Pro Val
225                 230                 235                 240

Ser Thr Ser Arg Asn Phe Ser Ser Trp Thr Trp Leu Gln Gly Tyr Asp
                245                 250                 255

Val Met Pro Ala Ile Ser Ser Trp Glu Thr Asn Met Asn Gln Tyr Ala
            260                 265                 270

Pro Asp Val Ile Gln Arg Lys Asp Gly His Phe Val Leu Tyr Tyr Ser
        275                 280                 285

Gly Glu Leu Lys Asp Trp Leu Arg His His Cys Val Gly Ala Ala Val
    290                 295                 300
```

pectinases.ST251

```
Ser Asn Gly Thr Ser Pro Leu Gly Pro Tyr Ile Pro His Asn Thr Thr
305                 310                 315                 320

Leu Ala Cys Pro Arg Asp His Gly Gly Ala Ile Asp Pro Ala Pro Phe
                325                 330                 335

Arg Asp Val Asn Gly Thr Leu Tyr Val Val Tyr Lys Val Asp Gly Asn
            340                 345                 350

Ser Ile Gly His Gly Gly Gly Cys Asn Asn Gly Lys Lys Pro Ile Val
        355                 360                 365

Ser Thr Pro Ile Met Leu Gln Gln Leu Lys Asp Asp Gly Val Thr Pro
    370                 375                 380

Val Gly Asp Pro Val Glu Ile Leu Thr Asn Glu Lys Val Asp Gly Pro
385                 390                 395                 400

Leu Val Glu Ala Pro Ala Ile Ile Arg Thr Asp Arg Gly Ile Tyr Tyr
                405                 410                 415

Leu Phe Phe Ser Ser His Cys Phe Thr Ser Ser Lys Tyr Ser Val Lys
            420                 425                 430

Tyr Ala Trp Ser Thr Ser Leu Lys Gly Pro Tyr Thr Arg Ala Glu Arg
        435                 440                 445

Pro Leu Phe Arg Ser Gly Asp Phe Gly Leu Lys Ser Pro Gly Gly Ala
    450                 455                 460

Thr Ala Ser Val Asp Gly Ser Arg Ile Val Phe His Ala Phe Cys Gly
465                 470                 475                 480

Asp Tyr Arg Cys Arg Val Ser Gly Lys Pro Ser Ile Leu Ser
                485                 490
```

<210> 91
<211> 251

pectinases.ST251

<212> PRT
<213> Aspergillus niger

<400> 91

Met Trp Thr His Leu Pro Ser Leu Cys Ala Leu Gly Leu Thr Leu Ile
1 5 10 15

Thr Ser Val Ile Thr Ser Pro Ile Glu Ile Arg Ala Thr Gly Pro Trp
20 25 30

Leu Ala Leu Asp Thr Asp Phe Pro Asp Pro Gly Phe Val Gln Ala Asp
35 40 45

Asp Gly Thr Trp Tyr Ala Phe Gly Thr Asn Gly Asn Asn Arg Thr Val
50 55 60

Gln Val Ala Lys Ser Ala Asp Phe Lys Thr Trp Thr Leu Leu Asp Lys
65 70 75 80

Glu Ala Leu Pro Thr Leu Ala Gly Trp Glu Thr Gln Ile Asp His Trp
85 90 95

Ala Pro Asp Val Val Arg Arg Val His Ser Pro Ser His Pro Ile Pro
100 105 110

Phe Pro Gln Ile Gln Thr Asn His His His His Pro Gln Asn Asp Gly
115 120 125

Lys Tyr Val Leu Tyr Tyr Ser Gly Glu Ala Gln Gln Met Leu Arg His
130 135 140

His Cys Ile Gly Thr Ala Val Ser Glu Ser Thr Asp Pro Ser Gly Pro
145 150 155 160

Tyr Ile Pro Asn Pro Thr Pro Leu Ser Cys Arg Leu Asp Gln Gly Gly
165 170 175

Ser Ile Asp Ala Ser Gly Phe Leu Asp Lys Asp Gly Ser Arg Tyr Val
180 185 190

pectinases.ST251

```
Val Phe Lys Val Asp Gly Asn Ser Ile Gly Asn Gly Gly Asp Cys Asn
        195                 200                 205

Asn Gly Ile Ala Pro Leu Lys Pro Thr Pro Ile Leu Leu Gln Lys Arg
    210                 215                 220

Arg Ala Val Gly Gly Gly Pro Glu Phe Asp Ser Ala Trp Gly His Val
225                 230                 235                 240

Leu Phe Val Leu Leu Asp Ala Leu Leu Tyr Gly
                245                 250
```

<210> 92
<211> 646
<212> PRT
<213> Aspergillus niger

<400> 92

```
Met Ile Ala Val Ala Lys Trp Leu Tyr Val Ala Val Thr Ala Tyr Phe
1               5                   10                  15

His Lys Leu Arg Pro Val Ser His Asp Tyr Pro Ala Leu Ala Ala Arg
            20                  25                  30

Asp Asn Gly Thr Asn Gly Ser Val Ala Ser Pro Ile Thr Leu Thr Val
        35                  40                  45

Glu Glu Ser Gly Gly Asn Gln Ser Ser Pro Leu Leu Tyr Gly Val Met
    50                  55                  60

Phe Glu Val Ile Tyr Ser Gly Asp Gly Gly Ile His Gly Gln Leu Leu
65                  70                  75                  80

Gln Asn Asn Gly Phe Gln Gly Asp Asp Pro Gly Leu Thr Ala Tyr Lys
                85                  90                  95

Ala Val Gly Pro Val Asp Leu Met Gln Asp Leu Ile Asn Pro Val Ser
            100                 105                 110
```

pectinases.ST251

Gly Ala Ile Thr Ser Ser Leu Gln Val Ser Val Asp Phe Glu Ala Thr
115 120 125

Gly Phe Val Gly Phe Ala Asn Thr Gly Tyr Ser Gly Ile Pro Val Met
130 135 140

Asn Ala Thr Tyr Ser Cys Gln Phe Trp Met Met Gly Glu Tyr Ser Gly
145 150 155 160

Thr Ile Met Leu Gln Leu Ala Gly Ser Thr Asn Asp Thr Ile Tyr Ala
165 170 175

Ser His Asn Ile Thr Val Lys Ser Ser Trp Gly Lys Phe Thr His Tyr
180 185 190

Gln Thr Ser Phe Asn Ser Ser Ala Ala Pro Asp Gly Asp Asn Glu Trp
195 200 205

Arg Leu Leu Phe Asn Gly Ser Lys Met Ala Gly Gly Met Leu Asn Phe
210 215 220

Gly Leu Val Gln Leu Phe Pro Pro Thr Tyr Lys Ser Arg Ser Asn Gly
225 230 235 240

Leu Arg Asn Asp Val Ala Thr Phe Leu Glu Lys Thr Ala Pro Ser Phe
245 250 255

Leu Arg Phe Pro Gly Gly Asn Asn Leu Glu Gly Leu Gln Ile Asp Ser
260 265 270

Arg Trp Gln Trp Asn Leu Thr Val Gly Pro Val Val Asp Arg Pro Gly
275 280 285

Arg Gln Gly Asp Trp Phe Tyr Pro Asn Thr Asp Ala Leu Gly Leu Asp
290 295 300

Glu Tyr Leu Trp Trp Cys Glu Asp Met Asn Met Glu Pro Val Leu Ala
305 310 315 320

pectinases.ST251

```
Val Trp Asp Gly Lys Ser Tyr Gly Gly Ile Leu Ser Gly Asp Asp Leu
                325                 330                 335

Gln Pro Tyr Ile Asp Asp Ile Met Asn Glu Leu Glu Tyr Leu Leu Gly
            340                 345                 350

Pro Val Asn Ser Thr Tyr Gly Ser Met Arg Ala Gln Asn Gly Arg Ser
        355                 360                 365

Lys Pro Trp Ser Ile Asn Tyr Ile Glu Ile Gly Asn Glu Asp Asp Phe
    370                 375                 380

Thr Gly Gly Cys Asp Thr Tyr Pro Asp Arg Phe Tyr Gln Ile Tyr Asn
385                 390                 395                 400

Ala Ile Ser Asn Ser Tyr Pro Asn Ile Thr Leu Ile Ala Ser Asn Ile
                405                 410                 415

Asp Tyr Leu Cys Leu Pro Ile Glu Pro Pro Pro Gly Leu Ile Tyr Asp
            420                 425                 430

Tyr His Tyr Tyr Arg Lys Pro Asp Asp Leu Val Ala Met Phe Asp Tyr
        435                 440                 445

Trp Asp Asn Gln Pro Arg Thr Gln Pro Ile Met Val Gly Glu Tyr Gly
    450                 455                 460

Cys Arg Asp Thr Ser Glu Ala Asp Gly Ile Phe Trp Ser Ser Met Gln
465                 470                 475                 480

Cys Ser Cys Ser Glu Ala Ala His Met Ile Gly Leu Glu Arg Asn Ser
                485                 490                 495

Asp Val Val Lys Met Ala Ala Tyr Ala Pro Leu Leu Gln His Phe Gly
            500                 505                 510

Tyr Thr Gln Trp Ser Pro Thr Leu Phe Gly Phe Asp Ser Ser Pro Asp
        515                 520                 525
```

pectinases.ST251

Ser Leu Thr Pro Ser Thr Ser Tyr Tyr Val Gln Arg Met Phe Ser Thr
530 535 540

Asn Arg Gly Asp Thr Ile Leu Pro Val Asn Thr Thr Ala Thr Phe Gly
545 550 555 560

Pro Leu Tyr Trp Val Ala Ser Arg Thr Asn Ser Thr Tyr Phe Val Lys
565 570 575

Leu Ala Asn Tyr Gly Ala Gln Asn Gln Thr Val Arg Val Lys Val Pro
580 585 590

Gln Thr Lys Thr Gly His Val Glu Met Leu Tyr Gly Pro Gln Asn Ala
595 600 605

Thr Asn Leu Val His Asn Ile Thr Val Gln Pro Thr Val Lys Asn Val
610 615 620

Thr Ser Ser Arg Gly Ile Tyr Ser Leu Asp Met Pro Pro Trp Gly Val
625 630 635 640

Ala Val Leu Ser Val Trp
645

<210> 93
<211> 396
<212> PRT
<213> Aspergillus niger

<400> 93

Met Pro Ala Thr Glu Ala Ala Ser Thr Val His Ser Pro Pro Val Ser
1 5 10 15

His Ser Ile Pro Pro Pro Met Asn Leu Val Leu His Gly Phe Ser Ser
20 25 30

Val Pro Gly Leu Val Ala Gly Asn Gly His Asp Cys His Phe Pro Ile
35 40 45

His Ala Thr Pro Ala Cys Pro Leu Ala Asp Tyr Arg Cys Leu His Gly

pectinases.ST251

50 55 60

Arg Pro Ser Tyr Thr Cys Ser Cys Leu Asn Phe Cys Gln Thr Glu Leu
65 70 75 80

Ser Thr Gln Leu Phe Arg His Ile Arg Ser Ser Ser Ala Gly Gly Ala
85 90 95

Ala Asp Ser Ile Pro Cys Arg Ala His Leu Ser Arg Gly Gly His Phe
100 105 110

Phe Ser Phe Glu Leu Glu Asp Glu Gly Tyr Ser Tyr Lys Asn Leu Lys
115 120 125

Gly Gln Ser Gln Ala Leu Glu Thr Ile Leu Ala Glu Ala Gly Ile Asn
130 135 140

Ser Val Arg Gln Arg Val Trp Gly Gln Phe Gln Ser Trp His Leu Gln
145 150 155 160

Phe Gly Leu Gln Leu Gly Ala Gly Lys Arg Val Lys Ala Ala Gly Met
165 170 175

Ser Ile Tyr Leu Asp Leu His Leu Asn Asn Asn Ile Asp Ile Glu Ile
180 185 190

Ile Ser Ile Gly Asn Glu Ile Arg Ala Gly Leu Leu Trp Pro Leu Gly
195 200 205

Glu Thr Ser Ser Tyr Ser Asn Ile Gly Ala Leu Leu Tyr Ser Gly Ala
210 215 220

Trp Gly Val Lys Asp Ser Asn Leu Ala Thr Leu Pro Lys Ile Ile Ile
225 230 235 240

His Leu Asp Asp Gly Trp Ser Trp Asp Gln Gln Ser Tyr Phe Tyr Lys
245 250 255

Thr Val Leu Ser Thr Gly Glu Leu Leu Asn Thr Asp Phe Asp Tyr Phe

pectinases.ST251

260 265 270

Gly Val Leu Tyr Tyr Leu Phe Tyr Ser Ala Ser Val Asn Ile Ala Ser
275 280 285

Leu Lys Thr Ser Leu Ala Asn Leu Gln Ser Ile Tyr Asn Lys Pro Val
290 295 300

Val Val Val Glu Met Asn Trp Pro Val Pro Cys Pro Asn Pro Glu Tyr
305 310 315 320

Ser Cys Phe Ser Asp Pro Arg Leu Ile Ser Phe Ser Val Ala Gly Gln
325 330 335

Gln Gln Phe Leu Glu Lys Leu Ala Ala Val Val Glu Ala Thr Thr Asp
340 345 350

Gly Gln Gly Val Tyr Tyr Trp Glu Pro Ala Trp Ile Thr Asn Ala Gly
355 360 365

Val Gly Ser Ser Cys Asp Glu Asn Leu Met Val Asp Arg Ser Thr Asp
370 375 380

Glu Val Tyr Ala Ser Phe Asp Ile Leu Gly Lys Leu
385 390 395

<210> 94
<211> 379
<212> PRT
<213> Aspergillus niger

<400> 94

Met Lys Tyr Ser Thr Ile Phe Ser Ala Ala Ala Ala Val Phe Ala Gly
1 5 10 15

Ser Ala Ala Ala Val Gly Val Ser Gly Ser Ala Glu Gly Phe Ala Glu
20 25 30

Gly Val Thr Gly Gly Gly Asp Ala Thr Pro Val Tyr Pro Asp Thr Ile
35 40 45

pectinases.ST251

```
Asp Glu Leu Val Ser Tyr Leu Gly Asp Asp Glu Ala Arg Val Ile Val
    50                  55                  60

Leu Thr Lys Thr Phe Asp Phe Thr Asp Ser Glu Gly Thr Thr Thr Gly
65                  70                  75                  80

Thr Gly Cys Ala Pro Trp Gly Thr Ala Ser Ala Cys Gln Val Ala Ile
                85                  90                  95

Asp Gln Asp Asp Trp Cys Glu Asn Tyr Glu Pro Asp Ala Pro Ser Ile
            100                 105                 110

Ser Val Glu Tyr Tyr Asn Ala Gly Val Leu Gly Ile Thr Val Thr Ser
        115                 120                 125

Asn Lys Ser Leu Ile Gly Glu Gly Ser Ser Gly Ala Ile Lys Gly Lys
    130                 135                 140

Gly Leu Arg Ile Val Ser Gly Ala Glu Asn Ile Ile Ile Gln Asn Ile
145                 150                 155                 160

Ala Val Thr Asp Ile Asn Pro Lys Tyr Val Trp Gly Gly Asp Ala Ile
                165                 170                 175

Thr Leu Asp Asp Cys Asp Leu Val Trp Ile Asp His Val Thr Thr Ala
            180                 185                 190

Arg Ile Gly Arg Gln His Tyr Val Leu Gly Thr Ser Ala Asp Asn Arg
        195                 200                 205

Val Ser Leu Thr Asn Asn Tyr Ile Asp Gly Val Ser Asp Tyr Ser Ala
    210                 215                 220

Thr Cys Asp Gly Tyr His Tyr Trp Gly Ile Tyr Leu Asp Gly Asp Ala
225                 230                 235                 240

Asp Leu Val Thr Met Lys Gly Asn Tyr Ile Tyr His Thr Ser Gly Arg
                245                 250                 255
```

pectinases.ST251

```
Ser Pro Lys Val Gln Asp Asn Thr Leu Leu His Cys Val Asn Asn Tyr
            260                 265                 270

Phe Tyr Asp Ile Ser Gly His Ala Phe Glu Ile Gly Glu Gly Gly Tyr
        275                 280                 285

Val Leu Ala Glu Gly Asn Val Phe Gln Asn Val Asp Thr Val Leu Glu
    290                 295                 300

Thr Tyr Glu Gly Ala Ala Phe Thr Val Pro Ser Thr Thr Ala Gly Glu
305                 310                 315                 320

Val Cys Ser Thr Tyr Leu Gly Arg Asp Cys Val Ile Asn Gly Phe Gly
                325                 330                 335

Ser Ser Gly Thr Phe Ser Glu Asp Ser Thr Ser Phe Leu Ser Asp Phe
            340                 345                 350

Glu Gly Lys Asn Ile Ala Ser Ala Ser Ala Tyr Thr Ser Val Ala Ser
        355                 360                 365

Ser Val Val Ala Asn Ala Gly Gln Gly Asn Leu
    370                 375
```

<210> 95
<211> 379
<212> PRT
<213> Aspergillus niger

<400> 95

```
Met His Tyr Lys Leu Leu Phe Ala Ala Ala Ala Ala Ser Leu Ala Ser
1               5                   10                  15

Ala Val Ser Ala Ala Gly Val Val Gly Ala Ala Glu Gly Phe Ala His
            20                  25                  30

Gly Val Thr Gly Gly Gly Ser Ala Ser Pro Val Tyr Pro Thr Thr Thr
        35                  40                  45
```

pectinases.ST251

```
Asp Glu Leu Val Ser Tyr Leu Gly Asp Asn Glu Pro Arg Val Ile Ile
    50                  55                  60

Leu Asp Arg Thr Phe Asp Phe Thr Gly Thr Glu Gly Thr Glu Thr Thr
65                  70                  75                  80

Thr Gly Cys Ala Pro Trp Gly Thr Ala Ser Gln Cys Gln Val Ala Ile
                85                  90                  95

Asn Leu His Ser Trp Cys Asp Asn Tyr Gln Ala Ser Ala Pro Lys Val
            100                 105                 110

Ser Val Thr Tyr Asp Lys Ala Gly Ile Leu Pro Ile Thr Val Asn Ser
        115                 120                 125

Asn Lys Ser Ile Val Gly Gln Gly Thr Lys Gly Val Ile Lys Gly Lys
    130                 135                 140

Gly Leu Arg Val Val Ser Gly Ala Lys Asn Val Ile Ile Gln Asn Ile
145                 150                 155                 160

Ala Val Thr Asp Ile Asn Pro Lys Tyr Val Trp Gly Gly Asp Ala Ile
                165                 170                 175

Thr Val Asp Asp Ser Asp Leu Val Trp Ile Asp His Val Thr Thr Ala
            180                 185                 190

Arg Ile Gly Arg Gln His Ile Val Leu Gly Thr Ser Ala Asp Asn Arg
        195                 200                 205

Val Thr Ile Ser Tyr Ser Leu Ile Asp Gly Arg Ser Asp Tyr Ser Ala
    210                 215                 220

Thr Cys Asn Gly His His Tyr Trp Gly Val Tyr Leu Asp Gly Ser Asn
225                 230                 235                 240

Asp Met Val Thr Leu Lys Gly Asn Tyr Phe Tyr Asn Leu Ser Gly Arg
                245                 250                 255
```

pectinases.ST251

```
Met Pro Lys Val Gln Gly Asn Thr Leu Leu His Ala Val Asn Asn Leu
            260                 265                 270

Phe His Asn Phe Asp Gly His Ala Phe Glu Ile Gly Thr Gly Gly Tyr
        275                 280                 285

Val Leu Ala Glu Gly Asn Val Phe Gln Asp Val Asn Thr Val Val Glu
    290                 295                 300

Thr Pro Ile Ser Gly Gln Leu Phe Ser Ser Pro Asp Ala Asn Thr Asn
305                 310                 315                 320

Gln Gln Cys Ala Ser Val Phe Gly Arg Ser Cys Gln Leu Asn Ala Phe
                325                 330                 335

Gly Asn Ser Gly Ser Met Ser Gly Ser Asp Thr Ser Ile Ile Ser Lys
            340                 345                 350

Phe Ala Gly Lys Thr Ile Ala Ala Ala His Pro Pro Gly Asn Ile Ala
        355                 360                 365

Gln Trp Thr Met Lys Asn Ala Gly Gln Gly Lys
    370                 375
```

<210> 96
<211> 395
<212> PRT
<213> Aspergillus niger

<400> 96

```
Met Lys Val Pro Phe Leu Gln Leu Leu Cys Leu Asn Ala Ala Leu Ala
1               5                   10                  15

Ser Ala Asn Val Val Lys Gly Ala Ala Gln Gly Phe Ala Ala Gly Val
            20                  25                  30

Thr Gly Gly Gly Asp Ile Thr Pro Ser Tyr Pro Lys Thr Asn Glu Glu
        35                  40                  45
```

pectinases.ST251

```
Leu Val Ser Leu Leu Glu Ser Asp Glu Pro Gln Val Val Val Leu Thr
    50                  55                  60

Lys Thr Phe Glu Phe Ile Gly Thr Glu Gly Thr Thr Thr Glu Asn Gly
65                  70                  75                  80

Cys Ala Pro Trp Gly Thr Gly Lys Ser Cys Gln Leu Ala Ile Asn Ser
                85                  90                  95

Asn Gly Trp Cys Gly Lys Asn Pro Val Val Thr Ile Thr Tyr Asp Asn
            100                 105                 110

Ala Ala Lys Asn Gly Ile His Ile Lys Ser Asn Lys Thr Leu Val Gly
        115                 120                 125

Glu Gly Asp Lys Gly Val Leu Ser Gly Lys Gly Leu Tyr Phe Glu Gly
    130                 135                 140

Gly Val Ser Asn Ile Ile Val Gln Asn Ile Lys Ile Thr Asn Leu Asn
145                 150                 155                 160

Pro Gly Phe Val Trp Gly Gly Asp Ala Phe Thr Phe Phe Gly Ala Asp
                165                 170                 175

Leu Ile Trp Ile Asp His Cys Glu Thr Ser Leu Thr Gly Arg Gln His
            180                 185                 190

Tyr Val Thr Gly Phe His Pro Asn Thr Arg Met Thr Trp Ser Asn Asn
        195                 200                 205

Phe Leu Asn Gly Val Thr Thr His Ser Ala Gly Cys Asp Asp His His
    210                 215                 220

Tyr Trp Thr Met Glu Leu Val Gly Pro Gly Asp Gln Ile Thr Phe Gln
225                 230                 235                 240

Asn Asn Tyr Val Tyr His Thr Thr Gly Arg Gly Pro Ala Leu Ser Gly
                245                 250                 255
```

pectinases.ST251

```
Thr Thr Leu Phe His Ala Val Asn Ser Val Trp Ser Ser Ile Pro Gly
            260                 265                 270

His Ala Ile Glu Gly Gly Asp Lys Gly Arg Gly Leu Phe Glu Gly Cys
        275                 280                 285

Phe Phe Glu Asp Val Val Glu Ile Ala Pro Ala Lys Pro Glu Asn Gln
    290                 295                 300

Leu Phe Ser Ala Ser Glu Ala Asn Ala Ala Ser Cys Lys Ser Ala Leu
305                 310                 315                 320

Gly Arg Ala Cys Gln Ala Asn Ser Tyr Ser Lys Ser Gly Ala Phe Gly
                325                 330                 335

Ser Ser Glu Thr Gly Phe Phe Lys Asp Phe Ala Gly Leu Thr Ile Ala
            340                 345                 350

Pro Ala Gly Ser Ala Thr Asp Ala Leu Ala Tyr Val Pro Lys Asn Cys
        355                 360                 365

Val Cys Ile Lys Gln Glu Gly Gly Phe Ser Lys Ala Arg Asn Phe Leu
    370                 375                 380

His Val Lys Gln Pro Asn Trp Leu Asp Pro Thr
385                 390                 395
```